THE GREAT COURSES®

Topic
Professional

Subtopic
Thinking Skills

Skepticism 101: How to Think like a Scientist

Course Guidebook

Professor Michael Shermer
Claremont Graduate University and Chapman University

PUBLISHED BY:

THE GREAT COURSES
Corporate Headquarters
4840 Westfields Boulevard, Suite 500
Chantilly, Virginia 20151-2299
Phone: 1-800-832-2412
Fax: 703-378-3819
www.thegreatcourses.com

Copyright © The Teaching Company, 2013

Printed in the United States of America

This book is in copyright. All rights reserved.

Without limiting the rights under copyright reserved above,
no part of this publication may be reproduced, stored in
or introduced into a retrieval system, or transmitted,
in any form, or by any means
(electronic, mechanical, photocopying, recording, or otherwise),
without the prior written permission of
The Teaching Company.

Michael Shermer, Ph.D.

Adjunct Professor
Claremont Graduate University
and Chapman University

Professor Michael Shermer is Adjunct Professor at Claremont Graduate University and Chapman University. He is also the founding publisher of *Skeptic* magazine (www.skeptic.com), the executive director of the Skeptics Society, a monthly columnist for *Scientific American*, and the host of the Skeptics Distinguished Science Lecture Series at the California Institute of Technology.

Professor Shermer received his B.A. in Psychology from Pepperdine University; his M.A. in Experimental Psychology from California State University, Fullerton; and his Ph.D. in the History of Science from Claremont Graduate University. He teaches a transdisciplinary course for Ph.D. students at Claremont Graduate University entitled Evolution, Economics, and the Brain and an honors course for undergraduates at Chapman University. He has been a college professor since 1979, also teaching psychology, evolution, and the history of science at Occidental College; California State University, Los Angeles; and Glendale Community College. As a public intellectual, Professor Shermer regularly contributes opinion editorials, book reviews, and essays to *The Wall Street Journal*, *Los Angeles Times*, *Science*, *Nature*, and other publications. He has appeared on such television shows as *The Colbert Report*, *20/20*, *Dateline NBC*, *Charlie Rose*, *Larry King Live*, *The Phil Donahue Show*, *The Oprah Winfrey Show*, and *Unsolved Mysteries* as a skeptic of weird and extraordinary claims. He also has been interviewed for countless science and history documentaries aired on PBS, A&E, the Discovery Channel, HISTORY, the Science Channel, and TLC. Professor Shermer was the cohost and coproducer of the 13-hour ABC Family television series *Exploring the Unknown*.

Professor Shermer's latest book is *The Believing Brain: From Ghosts and Gods to Politics and Conspiracies—How We Construct Beliefs and*

Reinforce Them as Truths. His previous book, *The Mind of the Market*, is on evolutionary economics, behavioral economics, and neuroeconomics. He also authored *Why Darwin Matters: Evolution and the Case against Intelligent Design* and *Science Friction: Where the Known Meets the Unknown*, about how the mind works and how thinking goes wrong. His book *The Science of Good and Evil: Why People Cheat, Gossip, Care, Share, and Follow the Golden Rule* is on the evolutionary origins of morality and how to be good without God. He wrote a biography, *In Darwin's Shadow*, about the life and science of the codiscoverer of natural selection, Alfred Russel Wallace. Professor Shermer also wrote *The Borderlands of Science*, about the fuzzy land between science and pseudoscience, and *Denying History*, on Holocaust denial and other forms of pseudohistory. His book *How We Believe: Science, Skepticism, and the Search for God* presents his theory on the origins of religion and why people believe in God. Professor Shermer's most famous book is *Why People Believe Weird Things*, on pseudoscience, superstitions, and other confusions of our time.

According to the late Stephen Jay Gould (from his foreword to *Why People Believe Weird Things*), "Michael Shermer, as head of one of America's leading skeptic organizations, and as a powerful activist and essayist in the service of this operational form of reason, is an important figure in American public life." ■

Table of Contents

INTRODUCTION

Professor Biography i
Course Scope 1

LECTURE GUIDES

LECTURE 1
The Virtues of Skepticism 4

LECTURE 2
Skepticism and Science 11

LECTURE 3
Mistakes in Thinking We All Make 20

LECTURE 4
Cognitive Biases and Their Effects 28

LECTURE 5
Wrong Thinking in Everyday Life 37

LECTURE 6
The Neuroscience of Belief 45

LECTURE 7
The Paranormal and the Supernatural 53

LECTURE 8
Science versus Pseudoscience 62

LECTURE 9
Comparing SETI and UFOlogy 70

LECTURE 10
Comparing Evolution and Creationism 79

Table of Contents

LECTURE 11
Science, History, and Pseudohistory 87

LECTURE 12
The Lure of Conspiracy Theories 95

LECTURE 13
Inside the Modern Cult 102

LECTURE 14
The Psychology of Religious Belief 111

LECTURE 15
The God Question 119

LECTURE 16
Without God, Does Anything Go?.....127

LECTURE 17
Life, Death, and the Afterlife 135

LECTURE 18
Your Skeptical Toolkit.....143

SUPPLEMENTAL MATERIAL

Glossary 151
Bibliography.....166

Skepticism 101: How to Think like a Scientist

Scope:

A 2009 Harris Poll of 2,303 adult Americans yielded the results shown in the following table in response to the prompt "Please indicate for each one if you believe in it or not."

Belief	Percent Believing
God	82
Miracles	76
Heaven	75
Jesus is God or the Son of God	73
Angels	72
Survival of the Soul after Death	71
The Resurrection of Jesus Christ	70
Hell	61
The Virgin Birth (of Jesus)	61
The Devil	60
Darwin's Theory of Evolution	45
Ghosts	42
Creationism	40
UFOs	32
Astrology	26
Witches	23
Reincarnation	20

For many of us, the fact that more people believe in angels and the devil than believe in the theory of evolution is disturbing. Yet such results match similar survey findings for belief in the paranormal conducted over the past several decades, including internationally. For example, a 2006 *Reader's Digest* survey of 1,006 adult Britons reported that 43 percent said they could read other people's thoughts or have their thoughts read, more than half said that they had had a dream or premonition of an event that then occurred,

more than two-thirds said they could feel when someone was looking at them, 26 percent said they had sensed when a loved-one was ill or in trouble, and 62 percent said that they could tell who was calling before they picked up the phone. A fifth said that they had seen a ghost, and nearly a third said that they believed that near-death experiences are evidence for an afterlife.

Although the specific percentages of belief in the supernatural and the paranormal across countries and decades vary slightly, the numbers remain fairly consistent that the majority of people hold some form of paranormal or supernatural belief. Alarmed by such figures and concerned about the dismal state of science education and its role in fostering belief in the paranormal, the National Science Foundation (NSF) conducted its own extensive survey of beliefs in both the paranormal and pseudoscience, concluding: "Such beliefs may sometimes be fueled by the media's miscommunication of science and the scientific process."

Part of the problem may be that 70 percent of Americans still do not understand the scientific process, defined in the NSF study as grasping probability, the experimental method, and hypothesis testing. One solution, then, is to teach how science works in addition to what science knows. Studies show that there is almost no correlation between science knowledge (facts about the world) and paranormal beliefs, but that when people are taught how science works and how to think like scientists, they are better able to evaluate the validity of extraordinary claims. The key to attenuating superstition and belief in the supernatural is in teaching how science works, not just what science has discovered.

Belief systems are powerful, pervasive, and enduring. This course synthesizes 30 years of research to answer the questions of how and why we believe what we do in all aspects of our lives. In this course, we are interested in understanding not just why people believe weird things or why people believe this or that claim but why people believe anything at all. The thesis of the course is straightforward:

> We form our beliefs for a variety of subjective, personal, emotional, and psychological reasons in the context of environments created by family, friends, colleagues, culture, and society at large; after

> forming our beliefs, we then defend, justify, and rationalize them with a host of intellectual reasons, cogent arguments, and rational explanations. Beliefs come first; explanations for beliefs follow. We might call this process belief-dependent realism, where our perceptions about reality are dependent on the beliefs that we hold about it. Reality exists independent of human minds, but our understanding of it depends on the beliefs we hold at any given time.

The brain is a belief engine. Once beliefs are formed, the brain begins to look for and find confirming evidence in support of those beliefs, which adds an emotional boost of further confidence in the beliefs and thereby accelerates the process of reinforcing them; round and round the process goes in a positive feedback loop of converting beliefs into truths. This course will teach you how to think and reason like a scientist in order to give you the necessary tools for evaluating claims and determining whether or not a belief you hold is provisionally true, very likely false, or somewhere in between.

The Virtues of Skepticism

Lecture 1

Skepticism is the rigorous application of science and reason to test the validity of any and all claims. Today, we are in dire need of skepticism because there has been a resurgence of superstition and magical thinking in our society and elsewhere in the world. Skepticism can counterbalance them by emphasizing the value of rational inquiry. In this course, we'll explore many claims that merit our skepticism, such as belief in the paranormal and the supernatural, creationism, Holocaust revisionism, various conspiracy theories, and more. In the end, we'll find that skepticism is a useful way of thinking to enable us to discover how the world really works.

What Is Skepticism?

- We define **skepticism** as the application of science and reason to test the validity of all claims. It is not a position that you stake out ahead of time and stick to no matter what. For example, many people who were initially skeptical of global warming are now believers, based on the facts that are available at the moment.

- It's important to note the phrase "at the moment" here. Conclusions in science and skepticism are provisional. It's acceptable to change your mind in science if the evidence changes. The important question to ask is: What are the facts in support of or against a particular claim?

- A popular notion holds that skeptics are closed-minded or cynical, but in principle, they aren't. Skeptics are curious but cautious. They believe many things—the germ theory of disease, the big bang theory of the universe, and so on—as long as there is reason and evidence to believe.

- It's not that skeptics believe nothing. In fact, they're even prepared to believe things for which hard evidence is still unavailable, such as the existence of aliens in the cosmos, which statistical probability

© Creatas/Thinkstock.

We remember a chance meeting with a friend in another city because our brains have evolved to notice unusual patterns, not to compute probabilities of such events happening after the fact.

suggests is almost inevitable. But most skeptics don't believe that aliens have visited Earth because no plausible proof has been put forth that they have.

- Being a skeptic means being rational and empirical: thinking and seeing before believing. Skepticism is not "seek and ye shall find," but "seek and keep an open mind." Having an open mind means finding the essential balance between orthodoxy and heresy, between a total commitment to the status quo and the blind pursuit of new ideas, between being open-minded enough to accept radical new ideas and so open-minded that your brains fall out. Skepticism is about finding that balance.

- One mission of skeptics is to address specific claims that scientists are typically too busy in their own fields to address. Such claims range from fire walking to creationism to Holocaust revisionism.

Scientists and historians sometimes fail in debates with proponents of alternative beliefs—not because they don't know their fields, but because they aren't skilled in rhetoric and sophistry.

- Starting in the 2000s, the skeptical movement investigated a series of beliefs and claims with serious implications for science and society, including questions about the relationship between vaccinations and autism, alternative/complementary medicine versus science-based medicine, longevity and the question of whether we're really living longer, the notion that the Bush administration orchestrated the 9/11 attacks, and most recently, the claim that the Obama administration orchestrated the attack at Sandy Hook Elementary School.
    - In these cases, skeptics took on popular misunderstandings, dangerous rumors, and deliberate scams by applying logic through the scientific method—and proved the claims dubious if not false.

    - Although it's almost impossible to eliminate misinformation entirely, skeptics believe that confronting and correcting it can help to neutralize its pernicious effects.

Why People Believe Weird Things

- What do skeptics define as a "weird thing"? Generally, a weird thing is one of the following: (1) a claim that is unaccepted by most people in a particular field of study, (2) a claim that is either logically impossible or highly unlikely, or (3) a claim for which the evidence is largely anecdotal and uncorroborated.

- Most of us think that only other people believe weird things; we certainly don't because we're too smart. But in fact, many smart people believe weird things, and they do so because they are skilled at defending beliefs they arrived at for non-smart reasons.

- Most of the time, we come to our beliefs for a variety of reasons having little to do with empirical evidence and logical reasoning and everything to do with genes, parents, siblings, peers, education, culture, and so on.

- Rarely do any of us sit down before a table of facts, weigh them pro and con, and choose the most logical and rational belief, regardless of what we previously believed.

- Instead, the facts of the world come to us through the colored filters of the theories, hypotheses, hunches, biases, and prejudices we have accumulated throughout our lifetimes. We then sort through the body of data and select the points that are most confirming of what we already believe and ignore or rationalize away those that are disconfirming.

Intelligence and Belief

- As we said, intelligence doesn't seem to be a potent defense against weird beliefs. Although there is some evidence that more intelligent people are slightly less likely to believe in some superstitions and paranormal beliefs, overall, conclusions are equivocal and limited.
  - On the one hand, a study conducted in 1974 with Georgia high school seniors found that those who scored higher on an IQ test were significantly less superstitious than students with lower IQ scores. And a 1980 study by psychologists James Alcock and L. P. Otis found that belief in various paranormal phenomena was correlated with lower critical thinking skills.

  - On the other hand, in his review of the literature in one of the best books on this subject (*Believing in Magic*), psychologist Stuart Vyse concludes that although the relationship between intelligence and belief holds for some groups, it can be just the opposite in others, such as the New Age movement.

- From this kind of research, it seems that intelligence is independent of belief. It may or may not lead people to be more or less skeptical of weird things. But it does enable people to better defend beliefs in weird things that they came to for reasons other than intelligence.

- Another problem is that smart people may be smart in only one field or in one way. We say that their intelligence is **domain specific**. The field of intelligence studies has witnessed a longstanding debate

about whether the brain is **domain general** or domain specific; the answer probably is that it's both.

- Harvard marine biologist Barry Fell serves as an example of how being smart in one field does not make one smart in another. Fell jumped fields into archaeology and wrote a bestselling book called *America B.C.* about all the people who discovered America before Columbus.

- Unfortunately, he was woefully unaware that archaeologists had already considered his different hypotheses but rejected them for lack of credible evidence.

- In many ways, the independent relationship between intelligence and beliefs is not unlike that between gender and beliefs. A number of studies have found that women hold more superstitious beliefs and accept more paranormal phenomena as real than men. But more men seem attracted to such beliefs as creationism, Holocaust revisionism or denial, UFOlogy and the presence of aliens, and conspiracy theories. Thus, although gender is related to the target of one's beliefs, it appears to be unrelated to the process of believing.

Education and Belief

- Psychologists Stuart and Lucille Blum found a negative correlation between education and superstition; in other words, as education increased, superstitious beliefs decreased. But education doesn't necessarily protect people from weird beliefs either.

- Professors Laura Otis and James Alcock showed that college professors are more skeptical of the paranormal than either college students or the general public (with the latter two groups showing the same level of belief), but that among college professors, there was variation in the types of beliefs held, with English professors more likely to believe in ghosts, ESP, and fortune telling.

- Another study found, not surprisingly, that natural and social scientists were more skeptical of the paranormal than their colleagues in the arts and humanities; psychologists were the most

skeptical of all—perhaps because they understand the psychology of belief and how easy it is to be fooled.

- Psychology professors Richard Walker, Steven Hoekstra, and Rodney Vogl discovered that there was no relationship between science education and belief in the paranormal among three groups of science students at three different colleges. They concluded: "Apparently, the students were not able to apply their scientific knowledge to evaluate these pseudoscientific claims."

Combining Skepticism with Education and Intelligence

- The psychologist David Perkins conducted an interesting correlational study, in which he found a strong positive correlation between intelligence (measured by a standard IQ test) and the ability to give reasons for taking a point of view and defending that position; he also found a strong negative correlation between intelligence and the ability to consider other alternatives.

- In other words, the smarter people are, the better they are able to defend their own beliefs as true and the less open they are to the truth of other people's beliefs. Smart people are better at rationalizing their beliefs with reasoned arguments, but as a consequence, they are less open to considering other positions.

- This is a lesson for us all: It's not enough to be smart and educated; you have to know how to use your intelligence and education in a particular way that leads you to a better understanding of how the world works. That's what skepticism is all about!

Important Terms

domain-general intelligence: An individual's ability to acquire and use knowledge to analyze various situations and conditions, find solutions to problems, and so on.

domain-specific intelligence: An individual's knowledge in a specific field, such as psychology, history, and so on.

skepticism: The rigorous application of science and reason to test the validity of any and all claims.

Suggested Reading

Alcock and Otis, "Critical Thinking and Belief in the Paranormal."

Blum and Blum, "Do's and Don'ts."

Collins and Pinch, *The Golem*.

Gardner, *Fads and Fallacies in the Name of Science*.

Gilovich, *How We Know What Isn't So.*

Huff, *How to Lie with Statistics*.

Olson, *Science Deified and Science Defied.*

Randi, *Flim-Flam!*

Sagan, *The Demon-Haunted World*.

Shermer, *Why People Believe Weird Things*.

Sulloway, *Born to Rebel*.

Taubes, *Bad Science*.

Questions to Consider

1. What is skepticism?

2. What is the physics behind fire walking?

3. What does research tell us about the relationship between intelligence/education and belief?

Skepticism and Science

Lecture 2

In the last lecture, we examined skepticism and what it means to be a skeptic, which as we saw, equates to a particular way of thinking about things, especially weird things. In this lecture, we'll look more closely at the most important way of thinking ever invented—science. We'll learn the scientific method, explore the tension between skepticism and credulity, and look at the demarcation problem—the need to find a criterion to distinguish between empirical science and pseudoscience.

A Skeptical Analysis of Miracles

- You may have had the experience of reaching for the phone to call a friend, only to have the phone ring and find that your friend is calling you. Or you may have had a dream that seemed to come true shortly after you had it, perhaps even a dream about the death of a loved one. Are such occurrences miracles?

- As skeptics, we analyze claims of miracles by starting with a definition: A **miracle** is an event with million-to-one odds of occurring. Intuitively, those odds seem rare enough to earn the moniker.

- Let's assume that we're awake for 16 hours a day and assign a number of 1 bit of data per second flowing into our senses as we go about our day. That nets us 57,600 bits of data per day, or 1,728,000 per month.
    - Even assuming that 99.9999 percent of those bits are totally unremarkable (thus, we filter them out or forget them), that still leaves 1.7 "miracles" per month.

    - Thanks to selective memory and the confirmation bias, we will remember only those few astonishing coincidences and forget the vast sea of meaningless data.

- We can employ a similar rough calculation to explain death premonition dreams.
  - The average person has about 5 dreams per night, or 1,825 dreams per year.
  - If we remember only 1/10 of our dreams, then we recall 182.5 dreams per year.
  - There are about 300 million Americans, who produce 54.7 billion remembered dreams per year.
  - Sociologists tell us that each of us knows about 150 people fairly well, thus producing a network social grid of 45 billion personal relationship connections.
  - With an annual death rate of 2.4 million Americans per year (all ages, all causes), it is inevitable that some of those 54.7 billion remembered dreams will be about some of these 2.4 million deaths among the 300 million Americans and their 45 billion relationship connections.

Skepticism and Science

- These back-of-the-envelope calculations are just the start of the skeptical analysis of a claim. The many tools of science are also part of our skeptical toolkit. In fact, modern skepticism and its insistence on questioning everything are embodied in the **scientific method**. That method involves gathering data to test natural explanations for natural phenomena.

- Skepticism's questioning outlook is a vital part of **science**, which we can define as: a set of methods to describe and interpret observed or inferred phenomena, past or present, aimed at testing **hypotheses** and building theories.
  - In this definition, "describe and interpret" captures the idea that science is not about just gathering facts but interpreting them. The facts never "speak for themselves."

- "Observed or inferred phenomena" accounts for the fact that we can see some things in nature, such as elephants and stars, but we must infer other things, such as the evolution of elephants and stars.

- "Past or present" tells us that science can be used to understand phenomena that occur both today and in the past. Historical sciences include cosmology, paleontology, geology, archaeology, and history itself.

- "Testing hypotheses" means that for something to be truly scientific, it must be testable, such that we may confirm it as probably true or disconfirm it as probably false.

- "Building theories" means that the aim of science is to explain the world by constructing plausible theories from numerous tested hypotheses.

- Defining the **scientific method** is not so easy, but most scientists agree that the following elements are involved in thinking scientifically:
  - **Induction**: forming a hypothesis by drawing general conclusions from existing data

  - **Deduction**: making specific predictions based on the hypotheses

  - **Observation**: the process of gathering data, driven by hypotheses that tell us what to look for in nature

  - **Verification**: the process of testing predictions against further observations to confirm or disprove the initial hypotheses

- Through the scientific method, we may discover **facts** about the world. A fact is defined as a conclusion confirmed to such an extent that it would be reasonable to offer provisional assent. All facts in science are provisional and subject to challenge. For

this reason, science is not a "thing" but a method that leads to provisional conclusions.

- A **theory** may be contrasted with a **construct**, that is, a nontestable statement to account for a set of observations. The living organisms on Earth may be accounted for by the statement "God made them" or the statement "They evolved." The first statement is a construct; the second, a theory.

- Through the scientific method, we aim for **objectivity**—basing conclusions on external validation—and we avoid **mysticism**—basing conclusions on personal insights that exclude external validation.

- Science is based on **rationalism**—basing conclusions on logic and evidence—and helps us avoid **dogmatism**—basing conclusions on authority rather than logic and evidence. Dogmatic conclusions are not necessarily invalid, but they introduce other questions: How did the authorities come by their conclusions? Were they guided by science or some other means?

The Tension between Skepticism and Credulity

- Despite these built-in mechanisms, science remains subject to problems and fallacies, ranging from inadequate mathematical notation to wishful thinking. But as the philosopher of science Thomas Kuhn noted, the "essential tension" in science is between total commitment to the status quo and blind pursuit of new ideas. The paradigm shifts and revolutions in science depend on proper balancing of these opposing impulses.

- When enough members of the scientific community (particularly those in positions of power) are willing to abandon orthodoxy in favor of a (formerly) radical new theory, then and only then can a paradigm shift occur.

- Charles Darwin is a good example of a scientist who negotiated the essential tension between skepticism and credulity.

Historian of science Frank Sulloway identifies three characteristics in Darwin's thinking that helped him find this balance: (1) respect for others' opinions, combined with a willingness to challenge authorities; (2) close attention to negative evidence; and (3) generous use of the work of others.

© iStockphoto/Thinkstock.

One need not understand gravity and the laws governing the motion of the planets to evaluate astrology; the important question to ask is: Does it work?

- The essential tension in dealing with "weird things" is between being so skeptical that revolutionary ideas pass you by and being so open-minded that flimflam artists take you in. Balance can be found by answering a few basic questions:
  - What is the quality of the evidence for the claim?
  - What are the background and credentials of the person making the claim?
  - Does the thing work as claimed?

The Demarcation Problem

- The need to find a criterion to distinguish between empirical science and pseudoscience is sometimes called the demarcation problem or the boundary problem. The philosopher Karl Popper first identified this problem and declared falsifiability as the ultimate criterion of demarcation.

- Whether a particular claim should be put into the set labeled "science" or "pseudoscience" depends not only on the claim per se but also on other factors, such as the proponent of the claim, the methodology, the history of the claim, attempts to test it, the coherence of the theory with other theories, and so on. It's thus

useful to expand our heuristic into three categories: normal science, pseudoscience, and borderlands science.

- "Normal science" refers to claims that are fully accepted as provisionally true by most scientists in a field. Examples include heliocentrism, evolution, quantum mechanics, big bang cosmology, and plate tectonics.

- "Pseudoscience" refers to claims that are fully rejected as very likely false by most scientists in a field. Examples include creationism, holocaust revisionism, alien abductions, and UFOs.

- "Borderlands science" refers to claims that are still controversial and undetermined as true or false by most scientists in a field. Examples include string theory, theories of consciousness, grand theories of economics, and some alternative medical practices.

- Because membership in these categories is provisional, it is possible for theories to be moved and reevaluated with changing evidence. Indeed, many normal science claims were once either pseudoscience or borderlands science.

- The difference between borderlands science and pseudoscience (or non-science) is that the practitioners of borderlands science are professionals who publish in peer-reviewed journals and try to devise ways to test their theories and falsify their hypotheses.

A Pragmatic Solution to the Demarcation Problem

- From a pragmatic perspective, science is what scientists do. The Nobel Prize–winning physicist Richard Feynman once explained the endeavors of scientists by outlining the three steps in the discovery of a new law of nature: (1) guess the law, (2) compute the consequences of the guess, and (3) compare the computation results to nature or experiment. If the results disagree with experiment, the guess is wrong.

- When discussing pseudoscience, we should bear in mind that those whom scientists and skeptics label as pseudoscientists do not consider themselves or their work as such. In their minds (to the extent we have access to them), they are cutting-edge scientists on the verge of a scientific breakthrough.

- The Princeton historian of science Michael D. Gordin notes, "Individual scientists (as distinct from the monolithic 'scientific community') designate a doctrine a 'pseudoscience' only when they perceive themselves to be threatened—not necessarily by the new ideas themselves, but by what those ideas represent about the authority of science…."

- Indeed, most scientists consider creationism to be pseudoscience, not because its proponents are doing bad science—they are not doing science at all—but because they threaten science education in America, they breach the wall separating church and state, and they confuse the public about the nature of evolutionary theory.

- Here, perhaps, is a practical criterion for resolving the demarcation problem: the conduct of scientists as reflected in the pragmatic usefulness of an idea. Does the revolutionary idea generate interest on the part of working scientists for adoption in research programs, produce new lines of research, lead to new discoveries, or influence existing hypotheses, theories, models, paradigms, or worldviews? If not, chances are it is pseudoscience. We can demarcate science from pseudoscience less by what science is and more by what scientists do.

- This demarcation criterion of usefulness has the advantage of being bottom up instead of top down, egalitarian instead of elitist, nondiscriminatory instead of prejudicial. Let science consumers in the marketplace of ideas determine what constitutes good science, starting with working scientists themselves and filtering through science editors, educators, and readers.

Important Terms

construct: A nontestable statement to account for a set of observations.

deduction: A specific prediction based on a hypothesis.

dogmatism: Basing conclusions on authority rather than logic and evidence.

fact: A conclusion confirmed to such an extent that it would be reasonable to offer provisional assent.

hypothesis: A testable statement accounting for a set of observations.

induction: The formation of a hypothesis by drawing general conclusions from existing data.

miracle: An event with million-to-one odds of occurring.

mysticism: Basing conclusions on personal insights that exclude external validation.

objectivity: Basing conclusions on external validation.

observation: The process of gathering data, driven by hypotheses that tell us what to look for in nature.

rationalism: Basing conclusions on logic and evidence.

science: A set of methods designed to describe and interpret observed or inferred phenomena, past or present, aimed at building a testable body of knowledge that is open to rejection or confirmation.

scientific method: The use of the hypothetico-deductive method, that is, the process of (1) putting forward a hypothesis, (2) conjoining it with a statement of initial conditions, (3) deducing from the two a prediction, and (4) finding whether or not the prediction is fulfilled.

theory: A well-supported and well-tested hypothesis or set of hypotheses.

verification: The process of testing predictions against further observations to confirm or disprove an initial hypothesis.

Suggested Reading

Collins and Pinch. *The Golem*.

Olson, *Science Deified and Science Defied.*

Sagan, *The Demon-Haunted World*.

Shermer, *Why People Believe Weird Things*.

Sulloway, *Born to Rebel*.

Taubes, *Bad Science*.

Questions to Consider

1. What are science and the scientific method?
2. What is the difference between a theory and a construct?
3. What is the difference between objectivity and mysticism?
4. What is the difference between rationalism and dogmatism?

Mistakes in Thinking We All Make

Lecture 3

In our first two lectures, we considered skepticism and science as ways of understanding the world and ourselves, and we saw how thinking like a skeptic and a scientist can help us avoid falling for nonsense, superstitions, or magical thinking. We also noted that the first principle of skepticism is to think for yourself. In this lecture and the two that follow, we'll look at a number of thinking fallacies and biases that interfere with our ability to reason clearly and rationally.

Feynman's Principle and Hume's Maxim

- In his book "*Surely You're Joking, Mr. Feynman!"* this Nobel physicist gave us a principle that should serve as our guide: "The first principle is that you must not fool yourself—and you are the easiest person to fool." But this principle is not exactly new; philosophers have understood for some time that humans are deeply flawed thinkers.

- In the 18th century, the Scottish philosopher David Hume wrote about what he called "consequent skepticism," which recognizes the "consequences" of our fallible senses but corrects them through reason. He came up with what we might call **Hume's maxim**: "A wise man proportions his belief to the evidence."

- Even more important is Hume's foolproof analysis of miracles. He asked the "what's more likely" question: What's more likely when you hear a fantastic story about some miraculous event—that the laws of nature were temporarily suspended or that those who think something was miraculous are mistaken?

- Combining Feynman's principle with Hume's maxim, we have the foundations of clear thinking: Proportion your belief to the evidence, don't be fooled by fantastic stories, and always remember that you are the easiest person to fool!

Fallacies in Thinking

- A common way of being fooled or making mistakes is by overestimating the power of anecdotes or stories, but anecdotes are not data. Our tendency is to believe whatever we hear, and anecdotes can be powerful belief engines, particularly about things we are most concerned about, such as health or medical claims.

- The person making an extraordinary claim has the **burden of proof** in convincing others that his or her belief has more validity than the one that is more universally accepted. In other words, you have to lobby for your opinion to be heard and marshal experts on your side to convince the majority to support your claim.

- Another common mistake in thinking is the idea that if you cannot explain something, it must be inexplicable and, therefore, a true mystery of the paranormal. Even those who are more reasonable sometimes think that if the experts cannot explain something, it must be inexplicable.
  - There are many genuine unsolved mysteries in the universe, and it is always acceptable to express our lack of understanding about such phenomena.
  - The problem is that most of us find it more comforting to have certainty, even if it is premature, than to live with unsolved or unexplained mysteries.

© Ron Chapple Studios/Thinkstock.

In a democratic republic, we elect officials to make decisions on science and technological matters that very few truly understand; a successful democracy depends on educated voters who know how to think critically and skeptically.

- One of the most common errors in thinking is called ***post hoc, ergo propter hoc*** ("after this, therefore because of this"), or after-the-fact

reasoning. At its basest level, this is a form of superstition, but even scientific studies can fall prey to this fallacy. Statisticians remind us, however, that correlation does not mean causation.

- Accidental and non-causal correlations are sometimes call coincidence, and in the world of the paranormal, coincidences are often seen as deeply significant. Sometimes "synchronicity" is invoked, as if some mysterious force were at work behind the scenes. But reason and observation suggest that synchronicity is most likely nothing more than the laws of probability at work, laws about which some of us have a very poor understanding.

- When dealing with events that seem unusual, we must also analyze them for their representativeness of their class of phenomena. That is, how likely is such a thing to occur given all the relevant factors?
  - The Bermuda Triangle provides an interesting example. Those who believe that there is something paranormal or supernatural at work there tend to misrepresent the baseline rate of accidents for the area.

  - In fact, far more shipping lanes run through the Bermuda Triangle than surrounding areas; thus, accidents and disappearances are more likely to happen in that area. Ironically, the accident rate is actually lower in the Bermuda Triangle than in surrounding areas.

  - We would all be well-advised to first thoroughly understand probable worldly explanations before turning to otherworldly ones. In other words, before we say that something is out of this world, let's first make sure that it is not in this world.

- The ***ad ignorantiam*** fallacy involves an appeal to ignorance or lack of knowledge, and it is related to the fallacies involving the burden of proof and the unexplained versus the inexplicable; here, someone argues that if you cannot disprove a claim, it must be true. But in science, belief should come from positive evidence in support of a claim, not lack of evidence for or against a claim.

- One of the most common errors in thinking we all make and that is on display in every political election is called ***ad hominem***. Literally translated, this means "to the man." This fallacy redirects the focus from thinking about the idea to thinking about the person holding the idea.

- Another common error in cognition is known as the **either-or fallacy**, the fallacy of negation, or the false dilemma. Here, we tend to dichotomize the world in such a manner that discrediting one position forces the acceptance of the other. But it is not enough to point out weaknesses in a theory. If your theory is superior, it must explain both the "normal" data explained by the old theory and the "anomalous" data not explained by the old theory.

- Many times we find ourselves trapped in **circular reasoning**, also known as the fallacy of redundancy, begging the question, or tautology, which occurs when the conclusion or claim is merely a restatement of one of the premises.
    - Christian apologetics is filled with tautologies: Is there a God? Yes. How do you know? Because the Bible says so. How do you know the Bible is correct? Because it was inspired by God. In other words, God is… because God is.

    - Science also seems to have its share of redundancies: What is gravity? The tendency for objects to be attracted to one another. Why are objects attracted to one another? Gravity. In other words, gravity is… because gravity is.

    - The difference here, however, is that science is not relying on authority for proof of gravity's existence. Science has observed gravity and devised highly accurate formulae to describe its effects, as well as theories about why it occurs.

- ***Reductio ad absurdum***, sometimes called the slippery-slope fallacy, is an attempted refutation of an argument by carrying it to its apparently logical and often absurd conclusion. According to

this fallacy, if an argument's apparent conclusions seem absurd, then the argument must be false.

- This is not necessarily so, though sometimes pushing an argument to its limits is a useful exercise in critical thinking. Often, this is a way to discover whether a claim has validity, especially if an experiment testing the actual reduction can be run.

- A recent subset of this fallacy has come to be known as *reductio ad Hitlerum*, in which one equates someone else's belief with Hitler and/or the Nazis, thereby gainsaying it by association with evil. This fallacy can be found in discussions involving politics, economics, or social issues.

Ideological Immunity, or the Planck Problem

- The Planck problem is not necessarily a fallacy in thinking but a problem we all face in resisting change, especially fundamental paradigm change. This problem relates to what the thinker Jay Stuart Snelson called our "ideological immune system." As Snelson wrote, "Educated, intelligent, and successful adults rarely change their most fundamental presuppositions."

- According to Snelson, the more knowledge individuals have accumulated and the more well-founded their theories have become, the greater the confidence they have in their ideologies. The consequence of this, however, is that we build up "immunity" against new ideas that do not corroborate previous ones.

- Historians of science call this the Planck problem after physicist Max Planck, who made this observation on what must happen for innovation to occur in science: "An important scientific innovation rarely makes its way by gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out and that the growing generation is familiarized with the idea from the beginning."

- Psychologist David Perkins conducted an interesting study in which he found a strong positive correlation between intelligence

(measured by a standard IQ test) and the ability to give reasons for taking a point of view and defending that position; he also found a strong negative correlation between intelligence and the ability to consider other alternatives. That is, the higher the IQ, the greater the potential for ideological immunity.

- Ideological immunity is built into the scientific enterprise, where it functions as a filter against potentially overwhelming novelty. But in the end, history rewards those who are "right" (at least provisionally). In astronomy, the Ptolemaic geocentric universe was displaced by Copernicus's heliocentric system. In biology, Darwin's evolution theory superseded creationist belief in the immutability of species.

Spinoza's Dictum

- It's important for us not to become smug in our ability to reason and think like scientists. These fallacies of thinking apply to everyone.

- Most believers in the paranormal, the supernatural, and the extraterrestrial are probably not hoaxers, con artists, or lunatics. Most are normal people whose normal thinking has gone wrong in some way. Thus, in talking to such believers, it's important to keep in mind the wise words of the 17th-century Dutch philosopher Baruch Spinoza: "I have made a ceaseless effort not to ridicule, not to bewail, not to scorn human actions, but to understand them."

- That said, in addition to understanding why people believe what they do, we need to be cognizant of the fact that ignorance and superstition can spread if they gain too much currency, and this can lead to both personal and political disasters. This is why clear thinking needs to be defended and refreshed constantly by educated, open minds.

Important Terms

ad hominem: Literally, "to the man"; this fallacy of thinking places the focus of inquiry on the person making the claim instead of on the claim itself. An "*ad hominem* attack" is an attack on the person instead of the argument.

ad ignorantiam: An appeal to ignorance or the belief that if someone cannot disprove a claim, then it must be true.

burden of proof: The principle in skeptical thinking that the burden of proof is on the person making the claim and not on the recipients of the claim.

circular reasoning: Also known as the fallacy of redundancy or a tautology, this is the process of attempting to prove a claim or bolster a belief by simply restating it in other words.

either-or fallacy: Sometimes called the fallacy of negation or the false dilemma, this is the attempt to set up a false choice between one claim and another, such that if you can disprove the first claim, the second one must be true. But this is not so; they could both be wrong. Positive evidence is needed in favor of a belief, not just negative evidence against another person's belief.

Hume's maxim: Observations by the 18th-century Scottish philosopher David Hume, considered one of the greatest skeptical thinkers in history, on the nature of belief, evidence, and miraculous claims: "A wise man proportions his belief to the evidence," and: "No testimony is sufficient to establish a miracle, unless the testimony be of such a kind that its falsehood would be more miraculous than the fact which it endeavors to establish."

post hoc, ergo propter hoc: Literally, "after this, therefore because of this"; also known as after-the-fact reasoning. This thinking is, at its basest form, superstition or magical thinking, connecting *A* to *B* when there is no connection. In statistical analysis, it comes in the form of "correlation does not mean causation."

reductio ad absurdum: The attempted refutation of an argument by carrying it to its apparently logical and often absurd conclusion. A recent subset of this fallacy has come to be known as *reductio ad Hitlerum*, in which one equates someone else's belief or claim with Hitler and/or the Nazis, thereby gainsaying it by association with evil.

Spinoza's dictum: An observation by the 17th-century Dutch philosopher Baruch Spinoza used as the motto of the Skeptics Society and *Skeptic* magazine: "I have made a ceaseless effort not to ridicule, not to bewail, not to scorn human actions, but to understand them."

Suggested Reading

Gardner, *Fads and Fallacies in the Name of Science*.

Gilovich, *How We Know What Isn't So.*

Huff, *How to Lie with Statistics*.

Kusche, *The Bermuda Triangle Mystery—Solved*.

Mlodinow, *The Drunkard's Walk*.

Randi, *Flim-Flam!*

Sagan, *The Demon-Haunted World*.

Shermer, *Why People Believe Weird Things*.

Vyse, *Believing in Magic*.

Questions to Consider

1. Why are anecdotes not reliable as sources of knowledge to confirm or disconfirm a belief?

2. When someone makes a claim, who has the burden of proof, the claimant to prove the claim or the receiver to disprove the claim?

3. Why is the unexplained not the same as the inexplicable?

4. Which of the logical fallacies most apply to you and to your friends and colleagues? Are they the same fallacies or different ones?

Cognitive Biases and Their Effects

Lecture 4

Why is it that we all tend to see the world in a way that makes our beliefs true and everyone else's beliefs that differ from ours false? The answer can be found in the study of cognitive biases. In the last lecture, we considered a number of logical fallacies that lead people to make bad arguments in favor of their beliefs. In this lecture, we'll look deeper into the brain at biases that are often subconscious. As we'll see, these cognitive biases shape how we interpret information that comes through our senses and mold it to fit the way we want the world to be—but not necessarily how it really is.

Confirmation Bias

- In the last lecture, we learned Feynman's principle: "The first principle is that you must not fool yourself—and you are the easiest person to fool." Our first cognitive bias is one that best explains why we are so capable of fooling ourselves. This is the **confirmation bias**, or the tendency to seek and find confirming evidence in support of what we already believe and to ignore or rationalize disconfirming evidence.

- Confirmation bias is sometimes described as the power of expectation. In a 1989 study by psychologists Bonnie Sherman and Ziva Kunda, for example, subjects were presented with evidence that both supported and contradicted a deeply held belief. The results showed that the subjects recognized the validity of the confirming evidence but were skeptical of the value of the disconfirming evidence. Other studies have shown that subjects fail to notice contradictory evidence or reinterpret it to favor their preconceived beliefs.

- Confirmation bias is particularly potent in political beliefs, most notably the manner in which our belief filters allow in information that confirms our political convictions and exclude information

that disconfirms those same convictions. Further, we tend to gather information about the world through sources that we know gibe well with our biases, which leads us to gather evidence in support of our beliefs and ignore or filter out contrary evidence.

- In a study on political beliefs, social psychologist Geoffrey Cohen discovered that Democrats are more accepting of a welfare program if they believe it was proposed by a fellow Democrat, even when, in fact, the proposal comes from a Republican and is quite restrictive. Cohen also found the same effect in reverse for Republicans.

- In other words, even when examining the exact same data, people from both parties arrive at radically different conclusions.

- Interestingly, we have some indication of where in the brain this phenomenon takes place.
  - Another study involving political beliefs and using brain scans of subjects found that the part of the brain most associated with reasoning was quiescent during the process of evaluating contradictory statements made by presidential candidates.

  - The parts of the brain that were most active were those involved in the processing of emotions and active in conflict resolution. Most tellingly, once subjects had arrived at a conclusion that made them emotionally comfortable, a part of the brain associated with reward became active.

  - In other words, instead of rationally evaluating a candidate's positions on this or that issue, we appear to have an emotional reaction to conflicting data, in which we rationalize away the parts that do not fit our preconceived beliefs, then receive a reward in the form of a neurochemical hit, probably dopamine, the brain drug associated with learning.

Hindsight Bias

- The **hindsight bias** is the tendency to reconstruct the past to fit with present knowledge. Once an event has occurred, we look back and

reconstruct how it happened, why it had to happen that way and not some other way, and why we should have seen it coming all along.

- We see this process at work on cable television shows that track the stock market throughout the day with an endless parade of financial experts whose prognostications are quickly forgotten as they shift to postdiction—or after-the-fact analysis—after the market closes. In fact, the hindsight bias is the cognitive process behind the *post hoc* fallacy.

- The hindsight bias is often on prominent display after a major disaster, when people think they know how and why the disaster occurred and why our experts and leaders should have seen it coming. The hindsight bias is equally evident in times of war, as we can see in conspiracy theories related to President Roosevelt's foreknowledge about the attack on Pearl Harbor or President George W. Bush's about September 11.

Self-Justification Bias

- The **self-justification bias** is the tendency to rationalize decisions after the fact to convince ourselves that what we did was the best thing we could have done. Once we make a decision about something in our lives, we carefully screen subsequent data and filter out all contradictory information related to that decision, leaving only evidence in support of the choice we made. This bias applies to everything from career choices to mundane purchases.

- One of the positive aspects of the self-justification bias is that no matter what decision we make, we will almost always be satisfied with the decision, even when the objective evidence is to the contrary.

- This process of cherry-picking the data happens at even the highest levels of expert assessment. The political scientist Philip Tetlock, for example, found that even though experts in politics and economics claim to have data in support of their predictions and assessments, in fact, their evaluations turn out to be no better than

those of non-experts—or even chance. Yet as the self-justification heuristic would predict, experts are significantly less likely to admit that they are wrong than non-experts.

- Consider what this bias means for the fate of the world economy, which is in the hands of such experts. To what extent are they influenced by this and other cognitive biases when they make crucial decisions that affect economic, political, and social policy?

- Of course, the fact that experts don't know everything doesn't mean that research and accumulated knowledge are worthless and all opinions are equal. The point here is that skepticism calls for reason, empirical research, and logical analysis—without bias.

Attribution Bias

- Our beliefs are very much grounded in how we attribute the causal explanations for them, and this leads to **attribution bias**, or the tendency to attribute different causes for our own beliefs and actions than those of others.

- The attribution bias is sometimes called the fundamental attribution error, and it comes in several varieties, including:
  - Situational attribution bias, in which we identify the cause of someone's belief or behavior in the environment

  - Dispositional attribution bias, in which we identify the cause of someone's belief or behavior as an enduring personal trait

  - Intellectual attribution bias, in which people consider their own beliefs as being rationally motivated

  - Emotional attribution bias, in which people see the beliefs of others as being emotionally driven

- As a result of attribution bias, we tend to see ourselves as rational and other people who disagree with us as irrational. This not only

© iStockphoto/Thinkstock.

The compromise necessary for a functional democracy to work is hampered if each side views the other as irrational, emotional, and unquestionably wrong; why compromise with people whose opinions you believe to be completely invalid?

makes it difficult for us to understand one another, but it makes it hard for us to see our own belief shortcomings.

Availability Bias and Representative Bias

- The **availability bias** is the tendency to assign probabilities of potential outcomes based on examples that are immediately available to us, especially those that are vivid, unusual, or emotionally charged. For example, your estimation of the probability of dying in a plane crash is directly related to the availability of just such an event in your world, especially your exposure to it in mass media.

- Related to the availability bias is the **representative bias**, or the tendency to judge the probability of an event based on the essential features of its parent type. This cognitive bias was identified by the psychologists Amos Tversky and Daniel Kahneman, who noted, "When faced with the difficult task of judging probability

or frequency, people employ a limited number of heuristics which reduce these judgments to simpler ones."

- The thought experiment known as the Linda problem illustrates this bias. When the description of Linda, a job candidate, was presented to subjects, 85 percent drew the wrong conclusion about her, that is, that she is both a bank teller and a feminist, rather than that she is simply a bank teller.

- Mathematically speaking, the bank teller/feminist choice is wrong because the probability of two events occurring together is less than the probability of either event occurring alone.

- Most people get the Linda problem wrong because they fall victim to the representative fallacy, in which the bank teller/feminist conclusion seems more representative of the description of Linda.

Other Biases and Beliefs

- Consistency bias is the tendency to recall one's past beliefs, attitudes, and behaviors as resembling present beliefs, attitudes, and behavior more than they actually do.

- In-group bias is the tendency for people to value more the beliefs and attitudes of those whom they perceive to be fellow members of their group and to discount and value less the beliefs and attitudes of those whom they perceive to be members of a different group.

- Negativity bias is the tendency to pay closer attention and to give more weight to negative events, beliefs, and information than to positive.

- Normalcy bias is the tendency to discount the possibility of a disaster that has never happened before.

- The "not invented here" bias is the tendency to discount the value of a belief or source of information that does not come from within yourself or your group.

- Projection bias is the tendency to assume that others share the same or similar beliefs, attitudes, and values and to overestimate the probability of others' behaviors based on our own behaviors.

- Rosy retrospection bias is the tendency to remember past events as being more positive than they actually were or as they were rated when the event occurred.

- Finally, **blind-spot bias** is the tendency to recognize the power of cognitive biases in other people but to be blind to their influence on our own beliefs.

Summing Up Cognitive Biases

- Hundreds of experiments in cognitive psychology reveal that even highly educated people make snap decisions under high levels of uncertainty, and they do so by employing these **cognitive heuristics** to shortcut the computational process.

- It's possible that these cognitive shortcuts evolved from a need to act swiftly and decisively in our ancestral environment rather than taking the time to collect additional information about potential predators and prey.

- It is not necessarily the case that these shortcuts are always bad, but they can lead us astray at times; thus, awareness of them can help us make more informed decisions.

Important Terms

attribution bias: The tendency to attribute different causes for our own beliefs and actions than those of others; also known as the fundamental attribution error. There are several variants: A situational attribution bias happens when we identify the cause of someone's belief or behavior in the environment; a dispositional attribution bias is when we identify the cause of someone's belief or behavior in the person as an enduring personal trait; an intellectual attribution bias is when people consider their own beliefs as

being rationally motivated; and an emotional attribution bias is when people see the beliefs of others as being emotionally driven.

availability bias: The tendency to assign probabilities of potential outcomes based on examples that are immediately available to us, especially those that are vivid, unusual, or emotionally charged.

blind-spot bias: The tendency to recognize the power of cognitive biases in other people but to be blind to their influence on our own beliefs.

cognitive heuristics: Thinking shortcuts to help us make snap decisions under uncertainty; also known as cognitive shortcuts or cognitive rules of thumb.

confirmation bias: The tendency to search for and find confirming evidence for what we already believe and to ignore or rationalize away disconfirming evidence.

hindsight bias: The tendency to reconstruct the past to fit with present knowledge; also known as Monday-morning quarterbacking.

representative bias: The tendency to judge the probability of an event based on the essential features of its parent type.

self-justification bias: The tendency to rationalize decisions after the fact to convince ourselves that what we did was the best thing we could have done.

Suggested Reading

Cialdini, *Influence*.

Damasio, *Descartes' Error*.

Darley and Gross, "A Hypothesis-Confirming Bias in Labelling Effects."

Festinger, Riecken, and Schachter, *When Prophecy Fails*.

Gilovich, *How We Know What Isn't So.*

Gilovich, Vallone, and Tversky, "The Hot Hand in Basketball."

Glassner, *The Culture of Fear*.

Huff, *How to Lie with Statistics*.

Kahneman, *Thinking Fast and Slow*.

Mlodinow, *The Drunkard's Walk*.

Nickerson, "Confirmation Bias."

Pronin, Lin, and Ross, "The Bias Blind Spot."

Simons and Chabris, *The Invisible Gorilla*.

Tavris and Aronson, *Mistakes Were Made (But Not by Me)*.

Questions to Consider

1. In what ways do cognitive biases help and hinder us in understanding the world?

2. In what way is 20/20 hindsight a bias that can blind us to the truth?

3. Why are experts no better than non-experts at predicting the future?

4. Why do we attribute different motives and causes to ourselves than to others?

5. Why are we able to recognize cognitive biases in other people but not in ourselves?

Wrong Thinking in Everyday Life

Lecture 5

In this lecture, we will apply some basic principles of skepticism and psychology to understand how and why people make mistakes in thinking in everyday life. We'll explore the rich body of research on how people behave irrationally when it comes to money, which cognitive biases and fallacies of thought most interfere with our ability to make rational decisions about our purchases and investments, and how to avoid the pitfalls that most people succumb to in one of the most important areas of life.

Compliance

- **Compliance** is the outward apparent conformity by individuals to group norms or an authority's commands. Of course, compliance with some group norms, such as driving on the right side of the road or practicing common courtesy, is the social glue of society. But compliance can have serious consequences when it leads us to "go with the flow" rather than think for ourselves.

- For example, in one demonstration, smoke was piped into a room in which one real applicant and several accomplices were filling out forms to be part of a new reality television show. The accomplices continued to fill out their forms as the room filled with smoke, as did most of the real subjects, even while looking around for some sort of sign that action should be taken.

- This demonstration illustrated the social psychological effect of **diffusion of responsibility**, or the collective belief among members of a group that someone else is taking responsibility for a particular problem or issue—to the point where no one acts.

Attentional Blindness

- We often think of our eyes as video cameras and our brains as blank tapes to be filled with percepts. Memory, in this flawed model, is

simply rewinding the tape and playing it back in the theater of the mind, but this is not at all what happens.

- The perceptual system and the brain that analyzes its data are deeply influenced by where we direct our attention and the beliefs we hold. As a consequence, much of what passes before our eyes may be invisible to a brain focused on something else.

- Psychologists call this phenomenon **attentional blindness**, or the tendency to miss something obvious and general while attending to something special and specific.

- This effect was discovered by the psychologists Daniel Simons and Christopher Chabris in a now-famous experiment. Subjects were asked to watch a 1-minute video of two teams of basketball players tossing two basketballs among themselves. The assigned task was to count the number of passes made by the team in white shirts. About 35 seconds into the video, a person dressed in a gorilla suit walked onto the court, thumped his chest, and exited. Amazingly, only half of the subjects noticed the gorilla!

- The implications of attentional blindness are staggering. Texting while driving is an obvious example, because in that case, the driver is looking away from the scene. But many times, we are blind to what is right in front of us; thus, we need to constantly remind ourselves to look for the unexpected.

Folk Numeracy

- Another way that our psychology can fool us in our everyday lives is captured in the idea of **folk numeracy**, that is, our natural tendency to misperceive probabilities, to think anecdotally instead of statistically, and to focus on and remember short-term trends and small-number runs.

- The chances of any one person winning the lottery, for example, are extremely low, but in the lottery system as a whole, someone will win. To the winner, the event seems unbelievably lucky, but to

everyone else, the fact that someone eventually had to win means that the win is not surprising.

- Other examples of folk numeracy include noticing a short stretch of cool days and ignoring the long-term global warming trend or getting upset over a downturn in the stock market while forgetting a half-century of upward-pointing trend lines. In fact, saw-tooth data trend lines are exemplary of folk numeracy, where our senses are geared to focus on each tooth's up or down angle while the overall direction of the blade is nearly invisible to us.

© Digital Vision/Thinkstock.

Savvy restaurateurs often list an expensive bottle of wine on the menu above other wine choices; the high-priced bottle anchors the customer's judgment at a high level.

Anchoring Effects

- In situations in which we lack an objective standard to evaluate beliefs and decisions—and such situations are not uncommon—we often grasp for any standard on hand, no matter how seemingly subjective. Such standards are called anchors, and their use can lead to the **anchoring effect**, or the tendency to rely too heavily on a past reference or on one piece of information when making decisions.

- The comparison anchor can even be entirely arbitrary. For example, the MIT behavioral economist Dan Ariely had subjects write down the last two digits of their Social Security numbers and then had them bid to buy such items as wine, chocolate, and a computer. (Subjects were uncertain of the values of the items.) Ariely found that subjects who had higher two-digit numbers made larger bids than subjects who had lower numbers. With no objective anchor for

comparison, this random anchor made people more vulnerable to arbitrary influence.

- Our intuitive sense of the anchoring effect and its power leads negotiators in corporate mergers, representatives in business deals, and even disputants in divorces to begin from an extreme initial position in order to set the anchor high for their side.

Sunk-Cost Effect

- Have you ever held onto a stock too long because you purchased it at a higher price and now it is lower? Or have you stayed with a business that was failing because you had sunk so much work into it? These are examples of the **sunk-cost effect**, or the tendency to believe in or do something because of the cost sunk into that belief or action.

- The sunk-cost effect is a basic fallacy of thinking: Why should past investment influence future decisions? If we were rational, we should just compute the odds of succeeding from this point forward and then decide if additional investment warrants the potential payoff.

- But we are not rational—not in business, not in love, and not even in war, as the examples of Iraq and Afghanistan illustrate. These wars cost us billions of dollars a year in military expenditures alone, along with thousands of American lives. No wonder that most members of Congress and four presidents have advocated "staying the course."

Status Quo Effect

- The **status quo effect** is the tendency to opt for whatever it is we are used to—the status quo. For example, most of us tend to prefer existing social, economic, and political arrangements over proposed alternatives, sometimes even at the expense of individual and collective self-interest.

- Economists William Samuelson and Richard Zeckhauser discovered that when people are offered a choice among four financial

investment options with varying degrees of risk, they select one based on their level of risk aversion, and their choices range widely. But when people were told that an investment tool had been selected for them and that they then had the opportunity to switch to another investment, 47 percent stayed with what they already had.

- The economists explained the effect as a consequence of three factors: "(1) rational decision making in the presence of transition costs and/or uncertainty; (2) cognitive misperceptions; and (3) psychological commitment stemming from misperceived sunk costs, regret avoidance, or a drive for consistency."

- In other words, we avoid uncertainty, we prefer lower transition costs of switching choices, and we misperceive what the other options are actually like.

- The status quo represents what we already have (and would have to give up in order to change) versus what we might have once we choose, which is far riskier. Maintaining the status quo is another reason that people tend to stay in jobs, homes, and marriages sometimes longer than they should; the sunk-cost effect directly links to the status quo effect.

The Endowment Effect, Loss Aversion, and Framing

- The psychology underlying the sunk-cost and status quo effects is what the economist Richard Thaler calls the **endowment effect**, or the tendency to value what we own more than what we do not own. In his research on the endowment effect, Thaler has found that owners of an item value it at roughly twice as much as potential buyers of the same item.

- The endowment effect may be traceable to the natural propensity for animals to mark their territories and defend them through threat gestures and even physical aggression. Evolution seems to have selected for creatures that were more willing to defend their own territory and resources than to attack another creature's because the attempt to take another's property was more costly than finding new territory of their own and defending it.

- The endowment effect with property ownership may well be connected to another psychological effect called **loss aversion**, where we are twice as motivated to avoid the pain of loss as we are to seek the pleasure of gain.
    - Evolution seems to have wired us to care more about what we already have than what we might possess; here, we find the evolved moral emotion that undergirds the concept of private property.

    - We might think of beliefs as a type of private property—in the form of our private thoughts with public expressions. The status quo bias, the endowment effect, and loss aversion lead us to want to hang on to our beliefs, even in the face of contradictory evidence.

- How beliefs are assessed is often determined by how they are framed; this is called the **framing effect**, or the tendency to draw different conclusions based on how data are presented. Framing effects are especially noticeable in financial decisions, as well as economic, political, and scientific beliefs.

Can We Think Clearly?

- Now that we know about these problematic ways of thinking and the various influences on our beliefs that can lead us astray, will we automatically think clearly from now on? Unfortunately, the answer is no. Vigilance is required to catch ourselves making mistakes in thinking.

- These social and psychological effects that cause us to err are why science has built-in self-correcting devices to weed out error and bias. For example, strict double-blind controls are required in experiments, in which neither the subjects nor the experimenters know the experimental conditions during the data-collection phase. Research results are vetted at professional conferences and in peer-reviewed journals, and research must be replicated in labs unaffiliated with the original researchers.

- Scientists are no less vulnerable to the effects of wrong thinking than anyone else; thus, such precautions must be vigorously enforced, especially by scientists themselves. In our everyday lives, we can practice thinking like scientists to help us avoid the pitfalls of wrong thinking.

Important Terms

anchoring effect: The tendency to rely too heavily on a past reference or on one piece of information when making decisions.

attentional blindness: The tendency to miss something obvious and general while attending to something special and specific.

compliance: The outward apparent conformity by individuals to group norms or an authority's commands.

diffusion of responsibility: The collective beliefs among members of a group that someone else is taking responsibility for a particular problem or issue, to the point where no one acts.

endowment effect: The tendency to value what we own more than what we do not own.

folk numeracy: Our natural tendency to misperceive probabilities, to think anecdotally instead of statistically, and to focus on and remember short-term trends and small-number runs.

framing effect: The tendency to draw different conclusions based on how data are presented or framed by choice alternatives.

loss aversion: Losses hurt twice as much as gains feel good; thus, we are averse to loss and avoid it where possible.

status quo effect: The tendency to opt for whatever it is we are used to, that is, the status quo.

sunk-cost effect: The tendency to believe in something because of the cost sunk into that belief.

Suggested Reading

Cialdini, *Influence*.

Gilovich, *How We Know What Isn't So*.

Gilovich and Belsky, *Why Smart People Make Big Money Mistakes and How to Correct Them.*

Glassner, *The Culture of Fear*.

Kahneman, *Thinking Fast and Slow*.

Shermer, *The Mind of the Market*.

Simons and Chabris, *The Invisible Gorilla*.

Tavris and Aronson, *Mistakes Were Made (But Not by Me)*.

Questions to Consider

1. What are compliance and diffusion of responsibility, and how do they lead us to fail to act when we should?

2. What is folk numeracy, and how does it lead us to misunderstand probabilities and to be fooled by randomness?

3. What are anchoring effects, and have you ever seen one on a restaurant menu?

4. What is the sunk-cost effect, and has it ever happened to you?

5. What is the status quo effect, and how does it lead to complacency?

6. What is the endowment effect, and how does it produce loss aversion?

The Neuroscience of Belief

Lecture 6

As we've seen in the past few lectures, all of us are subject to errors and biases in our thinking. In this lecture, we'll look at why that is—in other words, the probable evolutionary origin of superstition and magical thinking and the reasons that all of us are more likely to make one type of error in thinking than another type. We'll also look at how the brain works, beginning with the neuron and its connections to other neurons in the brain and working our way up through the neural networks that go into the formation of beliefs. We'll close by looking at how this information answers the mind/brain debate.

Patternicity

- Imagine that you are a hominid walking along the grassy plains of an African valley 3 million years ago. You hear a rustle in the grass. Is it a dangerous predator or just the wind? Your answer could mean life or death.
    - If you assume that the rustle in the grass is a dangerous predator, but it turns out to be just the wind, you have made what is called a **type I error** in cognition, that is, believing a pattern is real when it is not.

    - But if you assume that the rustle in the grass is just the wind and it turns out to be a dangerous predator, you're lunch! This is a **type II error** in cognition, that is, believing a pattern is not real when it is.

- Our brains are belief engines, evolved pattern-recognition machines that create meaning out of the patterns we think we see in nature. Sometimes, the association is not real and may be relatively harmless. When the association is real, however, we learn something valuable about the environment, from which we can make predictions that aid in survival and reproduction. We appear to be the descendants of those who were most successful at finding patterns.

- This process, **patternicity**, is the tendency to find meaningful patterns in both meaningful and meaningless noise. It occurs whenever the cost of making a type I error is less than the cost of making a type II error. But in our ancestral environments, assessing the difference between these types of errors was problematic in the split-second timing that often determined the difference between life and death; thus, the default position is to assume that all patterns are real. This is the basis for superstition and magical thinking.

© iStockphoto/Thinkstock.

Most people predict that the outcome of three consecutive rolls of a die is more likely to be 5-1-3 than 2-2-2; in fact, both outcomes are equally likely.

Locus of Control

- Patternicities do not occur randomly but are related to the context and environment of the organism, especially to the extent an individual believes that he or she is in control of the environment. Psychologists call this **locus of control**.

- People who rate high on internal locus of control tend to believe that they make things happen and are in control of their circumstances; people who score high on external locus of control tend to think that circumstances are beyond their control and things just happen to them.

- Locus of control is also mediated by levels of certainty or uncertainty in the environment. The anthropologist Bronislaw Malinowski's studies of superstitions among the Trobriand Islanders in the South Pacific demonstrated that as the level of uncertainty in the environment increased, so too, did the level of superstitious behavior in the form of rituals performed before and after fishing expeditions.

- The relationship among personality, belief, and patternicity was also explored by the experimental psychologist Susan Blackmore. She discovered that people who believe in **ESP** tend to look at data sets and see evidence of the paranormal, whereas skeptics do not. She also found that believers tend to recognize more patterns but make more type I false-positive errors in identifying those patterns than do nonbelievers.

Patternicity in the Brain

- Our brains are divided into two hemispheres connected in the middle at the corpus callosum; inputs from the left side of the body go to the right hemisphere and inputs from the right side of the body go to the left hemisphere. Carl Sagan conjectured that the right hemisphere "may perceive patterns and connections too difficult for the left hemisphere; but it may also detect patterns where none exist." Sagan further said, "Skeptical and critical thinking is not a hallmark of the right hemisphere."

- Evidence for this observation was found by the Swiss neuroscientist Peter Brugger, who presented random-dot patterns to subjects in a divided visual field paradigm so that either the left hemisphere or the right hemisphere of the brain was exposed to the image. Brugger found that both believers and nonbelievers in the paranormal perceived significantly more meaningful patterns in the right hemisphere than in the left.

- The left cortex of the brain is dominant in verbal tasks, such as writing and speaking, and the right cortex is dominant in nonverbal and spatial tasks. The left hemisphere is the literal, logical, rational brain, and the right hemisphere is the metaphorical, holistic, intuitive brain.

- The dominance of one hemisphere over the other is neither good nor bad; the type of thinking required depends on the task. Creativity, for example, appears to be related to right-brain dominance, which makes sense given that the ability to find new and interesting patterns in both meaningful and meaningless noise

is what creativity is all about. The key is to find a balance between keeping our minds open enough to see new patterns but not so open that we believe every pattern we see is real.

Agenticity

- **Agenticity** is the tendency to infuse patterns with meaning, intention, and agency. That is, we often impart agency and intention to the patterns we find and believe that these intentional agents control the world, sometimes invisibly from the top down, instead of the bottom-up causal randomness that makes up much of our world. Agenticity forms the basis of shamanism, paganism, animism, polytheism, monotheism, and all modes of Old and New Age spiritualisms.

- In his 2009 book *Supersense*, University of Bristol psychologist Bruce Hood documents the growing body of data demonstrating not only our tendency to infuse patterns with agency and intention but also to believe that objects, animals, and people contain an essence—something that is at the core of their being that makes them what they are—and that this essence may be transmitted from objects to people and from people to people.

- Hood finds evolutionary reasons for this **essentialism**, rooted in fears about diseases and contagions that contain all-too-natural essences that can be deadly (and, hence, should be avoided); thus, there was a natural selection for those who avoided deadly diseases by following their instincts about essence avoidance.

- But we also generalize these essence emotions to both natural and supernatural beings, to any and all objects and people, and to things seen and unseen, and we assume that those seen and unseen objects and people also have agency and intention.

Patternicity, Agenticity, and the Workings of the Brain

- What is actually going on inside the brain when we "believe" something? Our perceptions of the world are filtered through our brains, which receive input from the senses; thus, on a fundamental

level, the variation in our beliefs is due to differences in the perceptual experiences that have shaped our individual brains.

- The brain consists of about 100 billion neurons and approximately 1,000 trillion synaptic connections between those neurons.

    - Neurons are elegantly simple electrochemical information-processing machines. Inside a resting neuronal cell there is more potassium than there is sodium; a predominance of anions—negatively charged ions—gives the inside of the cell a negative charge.

    - When a neuron is stimulated by the actions of other neurons, the permeability of the cell wall changes, allowing sodium to enter and the cell wall to reach a critical point. That causes an instant spike in voltage, which spreads throughout the cell body and cascades down the cell to the next neuron in line. When this happens, we say that the cell "fired."

    - Note that if the "critical point" for the neuron to fire is not reached, then it does not fire; if the critical point is reached, then the neuron fires. It's an on-or-off system.

    - If we consider these neuronal on-or-off states as a type of mental state, with one neuron giving us two mental states (on or off), then there are 2×10^{15} possible choices available to the brain in processing information about the world and the body it is running. In essence, the brain is an infinite information-processing machine.

- Of course, we are not aware of the workings of our own electrochemical systems. What we actually experience is what philosophers call **qualia**, subjective states of thoughts and feelings that arise from a concatenation of neural events. But even qualia are the result of the electrochemical process of neuronal **action potentials**, or neurons firing and communicating.

Brain and Mind

- This model of the brain is accepted by all neuroscientists and is not controversial. What it implies, however, is controversial: All experience—including our sense of reality and our sense of self—is mediated by the brain.

- There appears to be no such thing as "mind" outside of brain activity. "Mind" is just a word we use to describe neural activity in the brain. But most people are **dualists**: They believe that there are two substances in the world—material and immaterial, body and soul, brain and mind.

- Medical evidence reinforces the fact that without neural connections in the brain, there is no mind. If part of the brain is destroyed through disease or injury, then that part's function is no longer carried out, unless—as is possible in some cases—it is rewired into another neural network in the brain.

- Still, Paul Bloom, a Yale University psychologist, says that we are natural-born dualists. The explanation for this may be found in agenticity and essentialism. This is the belief that all things have an "essence"—a core, a spirit—that makes them who or what they are and not something else; with our propensity to be dualists, we also tend to think that this essence is noncorporeal, nonmaterial, or spiritual. In other words, the essence is the "soul" of a thing.

- Such beliefs are not supported by neuroscience. For example, damage to the fusiform gyrus of the temporal lobe causes face blindness—the inability to recognize familiar faces—and stimulation of this same area causes people to see faces spontaneously that are not really present. Further, neuroscientists can predict human choices from brain scan activity before subjects are even consciously aware of the decisions made.

- Thousands of experiments confirm the hypothesis that neurochemical processes produce subjective experiences, that the mind is nothing more than the brain in action.

Important Terms

action potential: When the cell wall of a neuron becomes permeable to sodium, with a corresponding shift in voltage from negative to positive, an electrical signal travels down the axon to the dendrites at the end of the neuronal cell, where the signal may then be passed on to other neurons; colloquially, the cell "fired."

agenticity: The tendency to infuse patterns with meaning, intention, and agency.

dualism: The belief in two substances in the world—corporeal and incorporeal, body and soul, brain and mind.

ESP: Extrasensory perception, or the claim that information may be transferred through nonsensory or extrasensory means beyond the present understanding of the science of sense perception.

essentialism: The belief that objects, animals, and people contain an essence—an invisible force or substance that is at the core of their being that makes them what they are—and that this essence may be transmitted from objects to people and from people to people.

locus of control: The extent to which an individual believes that he or she is in control of the environment (internal locus of control) or that the environment controls the individual (external locus of control).

patternicity: The tendency to find meaningful patterns in both meaningful and meaningless noise.

qualia: The subjective experience of the world through thoughts and feelings that arise from a concatenation of neural events.

synapse: The tiny gap between neurons in the brain by which they can communicate by releasing neurochemical transmitter substances across the gap to trigger (or not) the receiving neuron to "fire," or have an action potential.

type I error: Assuming that two events are connected when they are not; also known as a false positive or believing that a pattern is real when it is not.

type II error: Assuming that two events are not connected when they are; also known as a false negative or not believing a pattern is real when it is.

Suggested Reading

Dennett, *The Intentional Stance*.

Hood, *Supersense*.

Koch, *The Quest for Consciousness*.

LeDoux, *Synaptic Self*.

Malinowski, *Magic, Science, and Religion*.

Marshall et al., "The Five-Factor Model of Personality as a Framework for Personality-Health Research."

Sagan, *The Dragons of Eden*.

Questions to Consider

1. What is patternicity, and how does it lead us to make more type I false-positive errors in thinking than type II false-negative errors in thinking?

2. What is agenticity, and how does it lead us to believe in ghosts, gods, angels, and demons?

3. What is essentialism, and how does it cause us to believe in invisible forces and substances?

4. How do neurons communicate in the brain?

5. How does the quantitative action of neurons swapping chemicals become the qualitative experience of thinking and sensing the world?

The Paranormal and the Supernatural

Lecture 7

In this lecture, we will learn how faulty neural activity and anomalous neural firing can lead to apparently paranormal, supernatural, and extraordinary experiences that prompt people to embrace all sorts of strange beliefs. We will also consider the fact that science searches for natural explanations for natural phenomena—there is no such thing as the paranormal or the supernatural; there is only the normal, the natural, and all the mysteries we have yet to explain. This lecture examines a number of paranormal and supernatural claims, how scientists think about them and put them to the test, and what all those failed tests tell us about the future of such claims.

Michael Persinger and the God Helmet

- The evidence that brain and mind are one is now overwhelming. Consider the research by neuroscientist Michael Persinger: In his laboratory at Laurentian University in Sudbury, Canada, he induces encounters with demons and out-of-body experiences in volunteers by subjecting their temporal lobes to patterns of magnetic fields.
    - Persinger uses electromagnets inside a modified motorcycle helmet (sometimes called the God helmet) to produce **temporal lobe transients** in his subjects—increases and instabilities in the neuronal firing patterns in the temporal lobe region, just above the ears.

    - Persinger believes that the magnetic fields stimulate **microseizures** in the temporal lobes, often producing what can best be described as spiritual or supernatural experiences, including the sense of a presence in the room, the bizarre distortion of body parts, and profound religious feelings of being in contact with God, saints, or angels.

    - The process itself is an example of agenticity, that is, the tendency to infuse patterns with intentional agents, often invisible beings who act in and influence our lives.

© iStockphoto/Thinkstock.

Participants in the Iditarod have been known to hallucinate animals, trains and airplanes, UFOs, voices, and occasionally, phantom people on the side of the trail or imaginary friends hitching a ride on the sled.

- Some neuroscientists are skeptical about Persinger's research, but for skeptics, it's important that his work is focused on trying to find natural explanations for apparently supernatural phenomena. According to Persinger, the "fate of the paranormal" is to become normal—to disappear under the scrutiny of the scientific method.

The Sensed-Presence Effect and the Paranormal

- One of the most effective means we have of understanding how the brain works is the study of what happens when it doesn't work well or when individuals are exposed to stress or extreme conditions. The third-man factor or the **sensed-presence effect**, a phenomenon that is well known among mountain climbers, polar explorers, isolated sailors, and endurance athletes, illustrates how extreme conditions can compromise brain function.

- The sensed presence is sometimes described as a guardian angel that appears in extreme and unusual environments. Particularly in

life-and-death struggles for survival in exceptionally harsh climes or under unusual strain or stress, the brain apparently conjures up help for physical guidance or moral support. The effect can be triggered by monotony, darkness, barren landscapes, isolation, cold, injury, and so on.

- Given that sensed-presence experiences occur in widely differing environments, it's likely that they are caused by more than one environmental factor, such as temperature, altitude, oxygen deprivation, physical exhaustion, and so on. Whatever the immediate cause, a deeper cause of the sensed-presence effect is also likely found in the brain.

- The process of sensing a presence is probably, in part, an extension of our normal expectations of having others around us because we are a social species. We have all lived with others, particularly in our formative years; thus, we develop a sense of the presence of others, whether they exist or not.

- A conflict between the **high road of controlled reason** and the **low road of automatic emotion** may also trigger a sensed presence.
    - Brain functions can be roughly divided into two processes, controlled and automatic. Controlled processes tend to use linear, step-by-step logic and are deliberately employed; we are aware of these processes when we use them. Automatic processes operate unconsciously, nondeliberately, and in parallel.

    - Controlled processes tend to occur in the front (orbital and prefrontal) parts of the brain. The prefrontal cortex is known as the executive region because it integrates the other regions for long-term planning. Automatic processes tend to occur in the back (occipital), top (parietal), and side (temporal) parts of the brain. The amygdala is associated with automatic emotional responses, especially fear.

    - Under extreme conditions, there may be a competition between these controlled and automatic brain systems. As in the fight-

or-flight response—in which blood flow is shunted toward the center of the body and away from the periphery—the body powers down higher functions in order to preserve the lower functions necessary for basic survival.

- In normal day-to-day living, the controlled circuits of reason keep our automatic circuits of emotions in check, ensuring that we do not give in to every whim and impulse. But when the rational governor is removed, the emotional machinery begins to spin out of control.

- A third possible explanation for the sensed presence is that there may be a conflict within the **body schema**, or our physical sense of self, in which the brain is tricked into thinking that another self is present.
  - Your brain has an overarching portrait of your body, from your toes to the top of your head. This is your body schema, and it extends beyond the body into the world when your thinking engages with other people through language or with any other extended reach from inside your head to outside your body. This body schema is you, and there is only one of you.

  - If your brain is tricked (or altered or damaged) into thinking that there is another you—an internal doppelgänger—a conflict inevitably arises with your single body schema. To adjust for this anomaly, your brain constructs a plausible explanation for this other you: It is actually someone or something else, a noncorporeal entity or soul coming out of your body or another person—a sensed presence.

  - Michael Persinger thinks that our "sense of self" is maintained by the left hemisphere temporal lobe. Under normal brain functioning, this is matched by corresponding systems in the right hemisphere's temporal lobe. When these two systems are out of synch, the left hemisphere interprets the uncoordinated activity as "another self" or a "sensed presence" because there can only be one self.

- Finally, the sensed-presence effect may result from a conflict within the **mind schema**, or our psychological sense of self, in which the mind is tricked into thinking that another mind is present.
    - Our brains consist of many independent neural networks that at any given moment are working away at various problems in daily living. Yet we do not feel like we're a bundle of networks; we feel like a single mind in one brain.

    - The neuroscientist Michael Gazzaniga thinks that we have a neural network that coordinates all the other neural networks and weaves them together into a whole. He calls this the "left-hemisphere interpreter," the brain's storyteller that puts together countless inputs into a meaningful narrative story.

    - Gazzaniga discovered this network while studying split-brain patients, in which the connection between the two hemispheres in their brains has been severed (usually done to stop the spread of seizures in epileptic patients). Gazzaniga also tells the remarkable story of patients with **reduplicative paramnesia**, a brain disorder in which people believe that there are copies of people or places that they mix up into one experience that makes perfect sense to them even if it sounds ridiculous to everyone around them.

Quantum Consciousness and the Paranormal

- Science has sought for years to make sense of the weirdness of the quantum world, as exemplified in Heisenberg's uncertainty principle, which states that the more precisely a particle's position is known, the less precisely its speed can be known, and vice versa. Science also continues to probe the mysteries of the macro world, such as consciousness.

- The concept of quantum consciousness presented in the film *What the #@*! Do We Know?!* is based on the work of Roger Penrose, a mathematical physicist, and Stuart Hameroff, an anesthesiologist, and has been popularized by such New Age gurus as Deepak Chopra. Their theory of quantum consciousness is as follows:

- Inside our neurons are tiny, hollow microtubules that act like structural scaffolding. Something inside the microtubules may initiate what is called in quantum physics a "wave function collapse" that leads to the quantum coherence of atoms. This causes neurotransmitters to be released into the synapses between neurons and, thus, triggers them to fire in a uniform pattern, thereby creating thought and consciousness.

- In other words, when you think a thought, the neurons in your brain are firing and sending chemical signals to one another. These chemicals are molecules that are made of atoms, which in turn are made of subatomic particles, where quantum effects can happen. One of these quantum effects is that one subatomic particle can affect another subatomic particle instantly and even when they are far apart, from the other side of the room to the other side of the planet.

- When you think a thought, quantum effects take place in your brain that can be transmitted through your skull, across space, and into my brain, causing my neurons to fire in synchronicity with your neurons and making it possible for me to read your mind. Further, the quantum interaction of your thoughts with the world could mean that what you think fundamentally changes the environment around you.

- According to Victor Stenger, a University of Colorado particle physicist, the mass of neural transmitter molecules and their speed across the distance of the synapse are about three orders of magnitude too large for quantum effects to be influential. In other words, the gap between quantum effects at the subatomic level and large-scale macro systems, such as the neurons in our brains, is too large to bridge. There is no micro-macro connection.

- We are not even close to understanding how the mind works enough to conclude that we must employ quantum mechanics in order to fully grasp its operations. Deepak Chopra argues that the hypothesis that consciousness creates brain is as likely to be true

as the hypothesis that the brain causes consciousness. But we know for a fact that measurable consciousness dies when the brain dies, so until proven otherwise, the default hypothesis must be that brains cause consciousness through neuronal activity and not vice versa.

- In short, there seems to be no reliable evidence of the paranormal or supernatural, and science and logic offer many reasons to doubt that they are anything but the products of our brains. We can keep ourselves plenty busy with the normal, the natural, and the mysteries we have yet to explain.

Important Terms

body schema: The brain's mapping of the body, from toes and fingers, through legs and arms, into the torso, and up the back to the top of the head. It may also extend beyond the body into the world when engaged with other people through language—when writing something down on paper or typing it into a computer—or when engaged in any other extended reach from inside the head to outside the body.

high road of controlled reason: Controlled processes in the brain that tend to use linear, step-by-step logic and are deliberately employed; we are aware of these processes when we use them. Such controlled processes tend to occur in the front (orbital and prefrontal) parts of the brain. The prefrontal cortex is known as the executive region because it integrates the other regions for long-term planning.

low road of automatic emotion: Automatic processes in the brain that tend to operate unconsciously, nondeliberately, and in parallel; we are unaware of these processes when we use them. Automatic processes tend to occur in the back (occipital), top (parietal), and side (temporal) parts of the brain. The amygdala is associated with automatic emotional responses, especially fear.

microseizures: Small seizures in the temporal lobes of brains that may produce what can best be described as "spiritual" or "supernatural" experiences: the sense of a presence in the room, an out-of-body experience,

bizarre distortion of body parts, and even profound religious feelings of being in contact with God, gods, saints, and angels.

mind schema: Similar to our body schema, the mind schema is our psychological sense of self, coordinating the various independent neural networks that at any given moment are working away at various problems in daily living into a coherent whole perceived as a "self." There is some evidence that this happens in the left hemisphere of the brain.

reduplicative paramnesia: A brain disorder in which people believe that there are copies of people or places that they mix up into one experience or story that makes perfect sense to them even if it sounds ridiculous to everyone around them.

sensed-presence effect: Sometimes called the third-man factor, the sense or feeling that someone or something else is present nearby, often triggered by monotony, darkness, barren landscapes, isolation, cold, injury, dehydration, hunger, fatigue, and fear.

temporal lobe transients: Increases and instabilities in the neuronal firing patterns in the temporal lobe region of the brain, located just above the ears. Such transients are associated with paranormal experiences.

Suggested Reading

Beyerstein, "Altered States of Consciousness."

Blackmore and Moore, "Seeing Things."

Brugger and Mohr, "Out of the Body, But Not Out of the Mind."

Brugger et al., "Functional Hemispheric Asymmetry and Belief in ESP."

Geiger, *The Third Man Factor*.

Hood, *Supersense*.

Huxley, *The Doors of Perception*.

Koch, *The Quest for Consciousness*.

LeDoux, *Synaptic Self*.

Malinowski, *Magic, Science, and Religion*.

Sacks, *The Man Who Mistook His Wife for a Hat*.

Sagan, *The Demon-Haunted World*.

Shermer, *The Believing Brain*.

Vyse, *Believing in Magic*.

Wiseman, *Paranormality*.

Questions to Consider

1. Why are such words as "paranormal" and "supernatural" not useful for scientists in understanding how the world works?

2. What is the "God helmet," and how can it induce paranormal experiences?

3. What is the sensed-presence effect, and how is it misinterpreted as paranormal?

4. What is quantum consciousness, and does it provide evidence for disembodied mind?

Science versus Pseudoscience

Lecture 8

This lecture delves deeply into human psychology, the need to believe, and how con artists and even the sincerely deluded employ age-old techniques to lure people into believing that paranormal powers are real. The reasons for explaining how psychics work and exploring the claims of UFOlogists in this lecture are twofold: (1) to avoid being taken in by people who do psychic readings or by claims of UFO sightings and (2) to show how scientists and skeptics test such claims, which further reveals how science and pseudoscience differ. In the process, we will also see some of the shortcomings of science.

Cold and Warm Readings

- In a **cold reading**, a "psychic" claims to "read" someone, having never met the subject and knowing only his or her name and gender. The psychic asks questions and makes numerous statements to see how the subject responds. Most of the statements are wrong, and subjects will visibly shake their heads no. But as we saw in the lecture on superstitious behavior, people need only an occasional reinforcement to be convinced that a real pattern is present.

- In addition to cold reading, psychics practice **warm reading**, which uses known principles of psychology that apply to nearly everyone. Many grieving people, for example, wear a piece of jewelry that has a connection to a loved one. Psychic mediums know this about those in mourning and may ask, "Do you have a ring or a piece of jewelry on you from this person?"

- Selective memory and the confirmation bias—where we remember the hits and forget the misses—also play a role in psychic readings. When people are interviewed after psychic readings, they often rattle off all the amazing hits the medium got with almost no effort but have difficulty remembering any misses at all.

© Ingram Publishing/Thinkstock.

Psychics use broad statements about such topics as health, relatives, relationships, money, and careers to try to elicit responses from subjects during readings.

- In *The Full Facts Book of Cold Reading*, Ian Rowland, a British magician and mentalist, demystifies psychic readings by providing a "personalized" psychological analysis that fits most people, lists of specific statements to which most people can relate, and lists of questions that put the onus on the subject to do the reading.

- Most bona fide scientists aren't interested in spending their valuable time testing what seem to be obviously bogus assertions, but as a way of getting further insight into the difference between science and pseudoscience, let's take a look at how a scientist might go about testing psychics to see if they can actually do what they claim.

Putting the Paranormal to the Test

- Science begins with something called a **null hypothesis**, the assumption or default position that the hypothesis under investigation is not true (null) until proven otherwise. We have to

assume that a psychic doesn't have special power until he or she proves otherwise by providing convincing experimental data to reject the null hypothesis.

- The statistical standards of proof needed to reject the null hypothesis are substantial. Ideally, in a controlled experiment, we would like to be at least 99 percent confident that the results were not due to chance before we offer our provisional assent that the effect may be real.

- Let's say we have a psychic turn playing cards over one by one, stating each time whether the upcoming card is red or black. How many correct hits would the psychic need in order for us to conclude that the card color determinations were not due to chance?
    - In this scenario, the null hypothesis is that the psychic will do no better than chance, or 50/50; thus, to reject the null hypothesis, we need to establish a figure for the number of correct hits greater than 50/50 needed in each round. In this example, the psychic would need to get 35 correct hits out of a 52-card deck in order for us to reject the null hypothesis at the 99 percent confidence level.

    - The statistical method by which this figure is derived need not concern us here. The point is that even though 35 out of 52 doesn't sound as if it would be that hard to obtain, in fact, by chance alone, it would be so unusual that we could confidently state that something else besides chance was at play.

    - What might that something else be? It could be ESP, but it might also be a lack of experimental control or some method of cheating on the part of the psychic. The fact that we don't know what the something else is does not make the paranormal real. The argument from personal incredulity—if I can't explain it, then it must be true—does not hold water in science.

- Even with controls in place, certainty still eludes science. The scientific method is the best tool ever devised to distinguish between

reality and fantasy, but we must always remember that we could be wrong. Rejecting the null hypothesis is not a warranty on truth, yet failure to reject the null hypothesis does not make the claim false.

Science and the Burden of Proof

- The null hypothesis is another example of the burden-of-proof argument we covered in the lecture on fallacies of thinking; that is, the burden of proof is on the person asserting a positive claim (that a hypothesis is true), not on scientists and skeptics to prove the null hypothesis.

- On the subject of **UFO** sightings, the null hypothesis states that UFOs are not extraterrestrial spaceships. The burden is on the UFO believer to provide evidence to reject the null hypothesis. UFOlogists may claim that they have such evidence, but scientists cannot accept as definitive proof of alien visitation such evidence as blurry photographs, grainy videos, and anecdotes about spooky lights in the sky.

- Many claims of this nature are based on negative evidence. Again, if science cannot explain X, then another explanation for X is necessarily true. But in science, many mysteries remain unexplained until further evidence arises. In contrast, the **principle of positive evidence** states that a claimant must have positive evidence in favor of a theory, not just negative evidence against rival theories. This principle applies to all claims.

Science's Shortcomings

- Because science is conducted by humans, it is naturally subject to all the same biases as every other human activity. Historians of science have determined, for example, that confirmation bias was hard at work in one of the most famous experiments in the history of science.
    - In 1919, the British astronomer Arthur Stanley Eddington set out to test Einstein's prediction for the degree to which the Sun would deflect light coming from a background star during an eclipse. The experiment was significant because it tested a

significant prediction of Einstein's theory of general relativity: Because the gravity of a massive object, such as the Sun, actually curves the spacetime around it, it would deflect the path of a beam of light coming from these background stars.

- As it turned out, Eddington's measurement error was as great as the effect he was measuring. As Stephen Hawking described it: "The British team's measurement had been sheer luck, or a case of knowing the result they wanted to get, not an uncommon occurrence in science."

- Of course, science includes a self-correcting mechanism to circumvent the confirmation bias, and that is that other scientists will check the results or rerun the experiment.

- Another example of bias in science comes from a famous paper in the history of psychology, "On Being Sane in Insane Places," written by Stanford University psychologist David Rosenhan and published in the prestigious journal *Science* in 1973.
  - The paper describes an experiment in which eight people—none of whom had any history of mental illness—entered mental hospitals and reported that they had brief auditory hallucinations. All eight were admitted; seven were diagnosed as schizophrenic and one as manic-depressive. After admission, the "patients" were instructed to tell the truth, act normally, and claim that the hallucinations had stopped.

  - Despite the fact that the nurses reported the patients as friendly, cooperative, and exhibiting "no abnormal indications," none of the hospital psychiatrists or staff caught on to the experiment. The diagnostic belief bias was pervasive. After an average stay of 19 days, all of Rosenhan's shills were discharged with a diagnosis of schizophrenia "in remission."

  - How did the pathology belief system transmogrify normal into abnormal behavior? Rosenhan explained: "Given that the patient is in the hospital, he must be psychologically disturbed. And

given that he is disturbed, continuous writing [note-taking on the part of the shills] must be behavioral manifestation of that disturbance, perhaps a subset of the compulsive behaviors that are sometimes correlated with schizophrenia."

- In a subsequent experiment to test the reverse power of diagnostic belief, Rosenhan contacted staff at a mental institution who had asserted that they would never have fallen for the ploy in the original experiment. Rosenhan told them that over the course of the next three months, he would send in one or more pseudopatients, with the staff instructed to record which patients they thought were fake.

- Once again demonstrating the power of belief to interpret the data in light of the diagnostic tool, out of 193 patients admitted to this hospital, 41 were classified as impostors by at least one staff member, with an additional 42 classified as suspected fakes. In fact, no pseudopatients were sent to the institution!

- Rosenhan concluded: "It is clear that we cannot distinguish the sane from the insane in psychiatric hospitals. The hospital itself imposes a special environment in which the meaning of behavior can easily be misunderstood." In other words, what you believe is what you see. The label is the behavior. Theory molds data, and concepts determine percepts.

- For these reasons, science insists on complete honesty and transparency in research. In fact, among scientists, there is what Richard Feynman called "a principle of scientific thought that corresponds to a kind of utter honesty—a kind of leaning over backwards." According to Feynman, "If you're doing an experiment, you should report everything that you think might make it invalid—not only what you think is right about it: other causes that could possibly explain your results."

- Feynman's admonition is a variation on assuming the null hypothesis—that an idea or finding is probably not true and that we should always be cautious of bias in ourselves, as well as others.

- It is important to recognize the fallibility of science and the scientific method. But within this fallibility lies the greatest strength of science: self-correction. Whether a mistake is made honestly or dishonestly, whether a fraud is unknowingly or knowingly perpetrated, in time, it will be flushed out of the system by lack of external verification.

Important Terms

cold reading: A type of mentalism in which someone "reads" someone else "cold," having never met the subject. It is a trick used by psychics and others to make it seem as if they have ESP.

null hypothesis: The assumption or default position that the hypothesis under investigation is not true (null) until proven otherwise.

principle of positive evidence: This principle states that a claimant must have positive evidence in favor of a theory, not just negative evidence against rival theories.

UFO: Unidentified flying object. The key word here is "unidentified," which is not synonymous with "extraterrestrial," even though many people assume that if an object cannot be identified as something from this world, then it must be from another world.

warm reading: A type of mentalism in which someone does a reading of someone else by stating information that is true for nearly everyone.

Suggested Reading

Collins and Pinch, *The Golem*.

Gardner, *Fads and Fallacies in the Name of Science*.

Hawking, *A Brief History of Time*.

Nickerson, "Confirmation Bias."

Randi, *Flim-Flam!*

Rosenhan, "On Being Sane in Insane Places."

Shermer, *Why People Believe Weird Things*.

Questions to Consider

1. What are cold readings and warm readings?

2. In what way do selective memory and the confirmation bias operate during a psychic reading?

3. What is the null hypothesis?

4. What is the difference between negative and positive evidence?

5. Who has the burden of proof in science, the person making the claim or the person hearing about the claim?

Comparing SETI and UFOlogy

Lecture 9

Throughout this course, we have made a distinction between science and pseudoscience as a way of thinking about thinking—that is, exploring why some methods of thinking are better than others in terms of understanding how the world works. A classic case study in scientific and unscientific thought can be found in a comparison between those who search for UFOs in the belief that they are extraterrestrial spaceships and those who search for signals from extraterrestrial intelligences. Neither group has found any evidence of aliens, yet most scientists think that one group is practicing science while the other is practicing pseudoscience. In this lecture, we'll explore the difference between UFOlogy and SETI—the search for extraterrestrial intelligence.

The Fermi Paradox

- Based on the 16th-century Polish astronomer Nicholas Copernicus's discovery that the Earth is not the center of the solar system, the **Copernican principle** holds that our planet has no special status in the cosmos, that we are not special, and that if the laws of nature operate elsewhere in the cosmos as they do here, then planets such as Earth and life such as ours should be typical and common.

- With the Copernican principle in mind, the Italian physicist Enrico Fermi proposed what has come to be known as the **Fermi paradox**: If there are lots of extraterrestrial intelligences out there and if at least some of them have figured out how to create self-replicating robotic spacecraft or developed practical interstellar space travel, and assuming that at least some of those intelligences are millions of years ahead of us on an evolutionary time scale, their technologies would be advanced enough to have found us by now—but they haven't. Where is everyone?

UFOs and the Roswell Incident

- One answer to the Fermi paradox is that aliens are already here. According to polls and surveys, at least one-third of people believe that UFOs represent the spaceships of extraterrestrial aliens.

- The modern interest in UFOs began on June 24, 1947, when a man named Kenneth Arnold was flying his private plane over the Cascade Mountains in Washington State and saw nine shiny objects moving across the sky. Arnold initially described them as flying like "geese in formation" but later added that the objects were "crescent shaped" and that they "moved like a saucer would if you skipped it across the water." An Associated Press story about the incident then misquoted Arnold as describing what he saw as "flying saucers."

- The AP story was picked up by more than 150 newspapers, and soon after, hundreds of flying saucer reports appeared. During this frenzy, a rancher named William Brazel, working outside Roswell, New Mexico, discovered some unusual debris scattered on the ground. Brazel notified the local sheriff, saying that he might have discovered the remains of one of the flying saucers.

- The story quickly reached the Roswell Army Air Field, at which point a lieutenant named Walter Haut sent out a press release stating that a "flying disc" had been recovered at the ranch. Haut had not seen the debris himself, but his press release launched the most famous UFO case in history: the Roswell incident. Shortly afterward, a more accurate description of what was found on the ranch appeared in the local newspaper, and the military concluded that the debris was the remains of a weather balloon. That was the end of the story for the next 30 years.

- Roswell didn't capture the attention of the U.S. public until 1980, when the *National Enquirer* ran a sensationalist story about the incident. The story was followed by a popular television documentary called *UFOs Are Real*, and the publication of a book called *The Roswell Incident*, outlining a government cover-up of the discovery of a crashed alien spacecraft in the New Mexico desert.

Since then, thousands of articles, books, and television shows have kept the Roswell myth alive.

- What really happened at Roswell is representative of what seems to happen repeatedly in UFO incidents and other examples of pseudoscience: facts are distorted, whether mistakenly or intentionally; misguided theories are built on the distortions; and reasonable denials provoke accusations of cover-ups that only spawn new theories.

- In fact, the debris discovered at the ranch in Roswell was not the remains of a weather balloon, as reported by the military. It was the remains of an experiment with high-altitude spy balloons designed to detect Soviet nuclear bomb tests in the upper atmosphere.

- UFOlogists make much of the fact that the government lied about what happened at Roswell, mistaking military secrets for UFO evidence. But of course, this was the period of the Cold War, and the U.S. government was understandably disinclined to publicly announce that it was carrying on surveillance of the Soviet Union nuclear program.

Alien Abductions

- Closely related to UFO sightings are the claims of alien abduction that appear in supermarket tabloids. Whitley Strieber wrote a bestselling account of his abduction, *Communion*. He is also a writer of science fiction, fantasy, and horror novels. Of course, skill at writing fiction would certainly equip Streiber to concoct alien abduction stories, but is it also possible that his mind invented those stories without his approval?

- As anyone who has ever served on a jury can tell you, the line between conscious fiction and subconscious imagination is a fine one. Reality and fantasy may blur in the recesses of the mind and come to the forefront under certain conditions, such as hypnosis and sleep. Thus, it may be no accident that hypnosis and sleep play a role in many abduction stories.

- Many abduction experiences are "remembered" years or decades after the fact through a technique called **hypnotic regression**. The technique involves hypnotizing a subject and asking him or her to imagine regressing back in time to retrieve a memory from the past. The subject is encouraged to play the memory back on the imaginary screen of the mind, as if watching a movie of his or her own experiences.

- A video playback system is not, however, an accurate representation of the way memory works. Memories are formed as part of a process of making connections between things and events in the environment. Repetitive associations between memories generate new dendritic and synaptic connections between neurons, which are then strengthened through additional repetition or weakened through disuse.

- When an alien contactee is "recovering" a memory of an abduction experience under hypnosis, it's fair to ask: What is actually being recovered? Analysis of hypnotic regression tapes used by abduction "therapists" shows that they ask leading questions and construct imaginary scenarios; their subjects may then combine elements of ordinary experience with suggested stories or concoct an entirely artificial event that never happened.

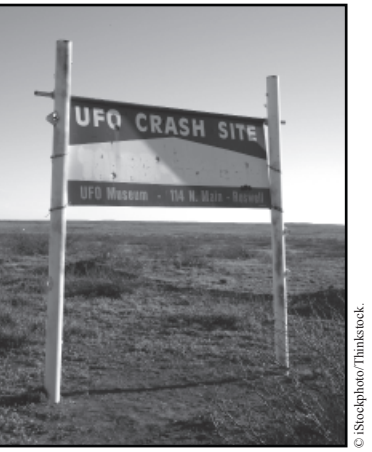
- Abduction experiences that are not generated through hypnotic regression typically occur late at night or early in the morning during sleep cycles that strongly resemble **hypnagogic** or **hypnopompic hallucinations**. These experiences appear to be related to **lucid dreams** and **sleep paralysis**, which have been well documented among subjects in experiments and patients in sleep labs and contain most of the components of the abduction experience.
  - Hypnagogic and hypnopompic hallucinations occur in the fuzzy borderlands between wakefulness and sleep, when our conscious brain slips into unconsciousness as we fall asleep or transitions into wakefulness from sleep. Multiple sensory modalities may be involved, including seeing and hearing

things that are not actually present, such as speckles, lines, geometrical patterns, and representational images or such sounds as a doorbell or even fragments of speech.

- Lucid dreams are stronger still, including dreams in which the sleeping person is aware that he or she is asleep and dreaming but can participate in and alter the dream.

- Sleep paralysis is a type of lucid dream in which the dreamer, aware of the dream, also senses paralysis, pressure on the chest, the presence of a being in the room, or the experience of floating, flying, falling, or leaving the body, with an emotional component that includes an element of terror but sometimes also excitement, exhilaration, or ecstasy.

- Stories of UFOs and alien abductions represent a sad ignorance on the part of an appalling number of people as to how science really works. That ignorance too often manifests itself in a distrust of scientific institutions and findings and a lack of public support for truly important scientific research, including the scientific search for extraterrestrial intelligences.



© iStockphoto/Thinkstock.

Scientific research on stories of UFOs and alien abductions indicates that these phenomena are far more likely to be the result of known psychological effects of terrestrial beings than the unknown physical characteristics of extraterrestrial beings.

SETI

- The **search for extraterrestrial intelligence (SETI)** began in earnest in 1960 when the Cornell University astronomer Frank

Drake conducted the first search with the 26-meter radio telescope at Green Bank, West Virginia.

- The following year, the first SETI conference was held, from which Drake compiled a list of factors that would have to come together for intelligent, communicating civilizations to evolve and make contact with us.

- These factors were plugged into what is now known as the **Drake equation** for estimating the number of technological civilizations that reside in our galaxy: $N = R f_p n_e f_l f_i f_c L$.

- What the Drake formula basically says is that the number of technological civilizations in our galaxy is likely to be a function of a number of factors: the rate of formation of stars suitable for life as we know it, the fraction of those stars with planets, the number of planets that are Earth-like, and so on.

- In the SETI literature, a figure of 10 percent is often used for the different factors in the equation, where in a galaxy of 100 billion stars, there will be 10 billion Sun-like stars, 1 billion Earth-like planets, 100 million planets with life, 10 million planets with intelligent life, and 1 million planets with intelligent life capable of radio technology.

- There's a good chance that we might make contact with an extraterrestrial intelligence in the next several years or decades. According to Frank Drake, our searches today are 100 trillion times more powerful than they were 50 years ago, with no end to the improvements in sight.

- Yet for all the promise of their work, SETI scientists never claim to know that aliens are out there. Why not? Because they have no evidence yet. This is why scientists say that SETI is science and UFOlogy is pseudoscience. SETI assumes the null hypothesis that aliens do not exist until contact is made, whereas UFOlogy rejects the null hypothesis outright by starting with the assumption that contact has already been made based on anecdotes alone.

Important Terms

Copernican principle: A principle based on the discovery of the 16th-century Polish astronomer Nicholas Copernicus that the Earth is not the center of the solar system. The principle holds that our planet has no special status in the cosmos, that we are not special, and that if the laws of nature operate elsewhere in the cosmos as they do here, then planets such as Earth and life such as ours should be typical and common.

Drake equation: Equation proposed in 1961 by the radio astronomer Frank Drake for estimating the number of technological civilizations that reside in our galaxy: $N = R\, f_p\, n_e\, f_l\, f_i\, f_c\, L$. The variables are as follows: N = the number of communicative civilizations, R = the rate of formation of suitable stars, f_p = the fraction of those stars with planets, n_e = the number of Earth-like planets per solar system, f_l = the fraction of planets with life, f_i = the fraction of planets with intelligent life, f_c = the fraction of planets with communicating technology, L = the lifetime of communicating civilizations.

Fermi's paradox: Named after the Italian physicist Enrico Fermi, who first proposed the problem: Assuming the Copernican principle that we are not special, abundant extraterrestrial intelligences (ETIs) should exist; if so, then at least some of these ETIs would have figured out self-replicating robotic spacecraft and/or practical interstellar space travel themselves. Assuming that at least some of those ETIs would be millions of years ahead of us on an evolutionary time scale, their technologies would be advanced enough to have found us by now, but they haven't, so… where are they?

hypnagogic hallucination: Delusional mental states that occur just after falling asleep, as the conscious brain slips into unconsciousness. In this fuzzy borderland between wakefulness and sleep, people report seeing and hearing things that are not actually present, such as speckles, lines, geometrical patterns, representational images, and voices and sounds.

hypnopompic hallucination: Delusional mental states that occur just before waking up, as the conscious brain emerges from the unconsciousness of sleep. In this fuzzy borderland between sleep and wakefulness, people report

seeing and hearing things that are not actually present, such as speckles, lines, geometrical patterns, representational images, and voices and sounds.

hypnotic regression: A technique in which a subject is hypnotized and asked to imagine regressing back in time to retrieve a memory from the past and then play it back on the imaginary screen of the mind. The technique is unreliable as a method of memory retrieval.

lucid dream: A dream in which the sleeping person is aware that he or she is asleep and dreaming but can participate in and alter the dream itself.

Search for Extraterrestrial Intelligence (SETI): The SETI Institute is based in Mountain View, California, and is the largest and most active organization searching for signals from extraterrestrials.

sleep paralysis: A type of lucid dream in which dreamers are generally not aware that they are dreaming but, rather, have the perception of being awake and in bed. They often feel paralyzed, have difficulty breathing, feel pressure on the chest, and sense the presence of another being in the room. Additionally, they sometimes feel themselves floating, flying, falling, or leaving the body, with an emotional component that includes an element of terror but sometimes also excitement, exhilaration, rapture, or sexual arousal.

Suggested Reading

Achenbach, *Captured by Aliens*.

Baker, "The Aliens among Us."

Basalla, *Civilized Life in the Universe*.

Clancy, *Abducted*.

Davies, *Are We Alone?*

Dick, *Plurality of Worlds*.

———, *The Biological Universe*.

Michaud, *Contact with Alien Civilizations*.

Plank, *The Emotional Significance of Imaginary Beings*.

Sagan, *The Demon-Haunted World*.

Swift, *SETI Pioneers*.

Webb, *If the Universe Is Teeming with Aliens…Where Is Everybody?*

Questions to Consider

1. What is the Drake equation, and how is it used to estimate the probability of making contact with ETIs?

2. If the odds are great that ETIs exist, why have we not yet made contact? Where is everyone?

3. What is more likely, that UFOs represent extraterrestrial beings from another planet or terrestrial aircraft and other atmospheric anomalies from this planet?

4. What is more likely, that alien abduction experiences represent extraterrestrial beings contacting humans in the middle of the night during sleep or lucid dreams and sleep anomalies, such as sleep paralysis?

5. Why do scientists tend to think of SETI efforts as good science whereas they consider UFOlogy to be pseudoscience?

Comparing Evolution and Creationism

Lecture 10

In the last lecture, we looked at the scientific and pseudoscientific search for aliens and extraterrestrial intelligences. Now, we turn our attention to a much more serious subject that has important political and cultural ramifications for science, education, and society: the debate between the theory of evolution and creationism. It's a debate that reveals the challenge that science and skepticism still face whenever they introduce new ideas that call long-held beliefs into question. It also reveals the persistence—and perniciousness—of wrong thinking and superstition. In this lecture, we'll track the battle between evolution and creationism in four rounds.

Round 1: The Banning of Evolution

- One of the most famous trials in courtroom history—the Scopes Trial—was the result of the passage by the state legislature in Tennessee of the Butler Act in 1925, outlawing the teaching of evolution in any public schools of the state.

- The Scopes Trial was instigated by the fledgling American Civil Liberties Union (ACLU), which initially saw the Butler Act as a simple violation of First Amendment rights.
    - On one side of the dock was the most famous defense attorney of his era, Clarence Darrow. On the other side was three-time presidential candidate and Christian fundamentalist orator William Jennings Bryan. Covering the trial for the *Baltimore Sun* was the unapologetically cynical reporter H. L. Mencken.

    - The young man on trial was John Thomas Scopes, a substitute teacher who volunteered to challenge Tennessee's "anti-evolution" law.

- Most people think that Scopes and science scored a victory in Tennessee, but in fact, it was the intention of the ACLU for Scopes to lose, which would have led to an appeal to the Tennessee State

Supreme Court and, eventually, a hearing in the U.S. Supreme Court. Scopes did lose, but Tennessee state legislators used a technicality to prevent an appeal from reaching the state supreme court. Thus, the ACLU never had a chance to take the case to the high court and use it to shape federal law.

- It's easy to dismiss the anti-evolution position as sheer ignorance, but William Jennings Bryan's story reveals interesting roots for the fear that many people still hold about evolution.
  - A liberal and free thinker on many other issues, Bryan took a stand against evolutionary theory after the First World War, when he became aware of the use of social Darwinism to justify militarism, imperialism, and the pseudoscience of eugenics. Eugenics advocated the elimination of undesirable characteristics from the human race through selective breeding.

  - Bryan abhorred the idea, which was outlined in a book of the time called *Headquarters Nights*, a recounting of its author's evenings spent with German military and intellectual leaders. These leaders justified their militarism and imperialistic expansionism with classic social Darwinism—the national survival of the fittest, improvement of the superior Germanic race, and elimination of unfit races.

  - Bryan became concerned for both his faith and his country. The enemy, in his mind, was not Germany but evolutionary theory, and Scopes's crime was to pass this poison on to the next generation.

  - In his promotion of Christian teachings over evolutionary theory, Bryan clearly stood in the way of what scientists would call progress. But it's worth noting that he also took a stand against the line of thinking that eventually led to the genocidal policies of Nazi Germany.

Round 2: Equal Time for Genesis and Darwin

- Ambivalence toward evolution in the United States kept the theory out of American schools until the late 1950s. That situation changed dramatically and suddenly on October 4, 1957, when the Soviet Union launched Sputnik 1, the first orbiting artificial satellite. Sputnik announced to America that we were falling behind in science and created a renaissance in American science education, during which evolutionary theory worked its way back into the mainstream of public education.

- In 1961, the National Science Foundation, in conjunction with the Biological Science Curriculum Study, outlined a basic program for teaching the theory of evolution and published a series of biology books whose common thread was the theory.

- Creationists responded with a new approach in which they demanded "equal time" for the Genesis story, along with the theory of evolution. They insisted that evolution was "only" a theory, not a fact, and should be designated as such.

- In 1965, a high school biology teacher in Little Rock, Arkansas, Susan Epperson, filed a suit against the state on the grounds that an anti-evolution bill passed in her state in 1928 violated her rights to free speech. In a later appeal to the U.S. Supreme Court, the Arkansas law was interpreted as an attempt to establish a religious position in a public classroom and was, therefore, overturned.

Round 3: Equal Time for Creation Science and Evolution Science

- In the next round of the conflict, religious references to biblical scripture were abandoned by a new group of creationists who attempted to make purely scientific arguments for creation, which they called "creation science" and contrasted with "evolution science." Two states, Arkansas and Louisiana, passed laws requiring schools to give creation science equal time. Once again, the ACLU was at the forefront of combating these laws, insisting that they were attempts to breach the wall separating church and state in public schools.

- In 1986, the famous case of *Edwards v. Aguillard*, originating in Louisiana, was argued before the U.S. Supreme Court. The ACLU initially took a minimalist approach by arguing that creationists have a religious agenda, but two justices countered that as long as someone is teaching good science, his or her religious beliefs are irrelevant.
    - This led the ACLU to argue that creation science isn't science. For this, it relied on an *amicus curiae*—or "friend of the court"—brief submitted to the Supreme Court by 72 Nobel laureates, 17 state academies of science, and 7 other scientific organizations.

    - The brief forcefully argued that creation science does not meet the criteria of genuine science. It set forth a definition of science, outlined the scientific method, explained the criteria for advancing from a hypothesis to a theory, and contrasted science with the kind of faith-based claims made by the proponents of creation science.

- In June of 1987, the court held that Louisiana's anti-evolution legislation "is facially invalid as violative of the Establishment

© iStockphoto/Thinkstock.

In 1987, the U.S. Supreme Court found Louisiana's anti-evolution law unconstitutional, with two justices, Antonin Scalia and William Rehnquist, dissenting.

Clause of the First Amendment, because it lacks a clear secular purpose" and that "[t]he Act impermissibly endorses religion by advancing the religious belief that a supernatural being created humankind."

- This decision set the precedent that the government cannot force public school teachers to teach a doctrine as scientific when the scientific community overwhelmingly agrees that it is not science. That was the death knell of creation science, which only led to the fourth round of the dispute: evolution versus **intelligent design**.

Round 4: Intelligent Design Creationism

- In the 1990s, creationists evolved a new strategy of arguing that living organisms exhibit features that appear to be designed. They have been careful not to identify who the designer might be, but they are nearly all Christians who personally believe the designer to be the God of Abraham.

- Intelligent design creationists have produced a large number of arguments that scientists have rebutted one by one. In general, their arguments follow this pattern: (1) *X* looks designed; (2) it's not clear how *X* was designed naturally; (3) therefore, *X* was designed supernaturally.

- The intelligent design creationist argument is sometimes called the "God of the gaps" argument: Wherever an apparent gap exists in scientific knowledge, God injects a miracle. This is not, of course, allowed in science. Scientific research proceeds in accordance with **methodological naturalism**; this principle holds that life is the result of natural processes in a system of material causes and effects that does not allow or need the introduction of supernatural forces. This fundamental concept is rejected by advocates of intelligent design.

- University of California law professor Phillip Johnson, the founding father of the intelligent design movement, has accused scientists of unfairly defining God out of the picture by limiting

the search for causes to only natural causes. He complained that scientists who postulate that there are supernatural forces at work in the natural world are pushed out of the scientific arena on the basis of nothing more than a fundamental rule of the game. To correct this perceived injustice, he urged that the rules be changed to allow methodological supernaturalism.

Dispelling the Fear of Evolution

- As the history of the evolution-versus-creationism debate demonstrates all too clearly, logic is not enough to end a dispute with the opponents of scientific findings if the logic of the findings is not what the opponents really oppose. The opponents of evolution seem to fear what the theory implies about humanity, God, and morality, and until they can be persuaded that their fear is misplaced, it seems likely that the dispute will continue.

- Those who fear evolution seem to believe that it implies God does not exist, and without a belief in God, there can be no morality or meaning. But such fears are unfounded. The theory of evolution is not inconsistent with God or the creation of the world by God. Nor does what the theory indicate about when the world was created make a difference; if God is eternal, what difference does it make when he created the universe? Further, why should it matter how God created life—whether through a miraculous spoken word or through the natural forces of the universe that God created?

- Creationism and intelligent design theory appear to be not only bad science but also bad theology. These views reduce the deity to a mere engineer, a garage tinkerer, a designer piecing together worlds and life forms out of available materials but not necessarily the creator of the original materials.

- If there is a God, the avenue to him is not through science and reason but through faith and revelation. If there is a God, he will be so wholly other that no science can reach him, especially not the science that calls itself intelligent design.

- Religious believers should embrace science, especially evolutionary theory, for what it has revealed about the magnificence of the divinity in a depth never dreamed by our ancient ancestors. We have learned much in 4,000 years, and that knowledge should never be dreaded or denied. Instead, science should be cherished by all who value human understanding and wisdom. Skepticism encourages people to do just that.

Important Terms

intelligent design, intelligent design creationism: The belief that the order, purpose, and design found in the world is proof of an intelligent designer and that the description of the creation in the Bible roughly matches that of modern science, although evolution is limited in what it can create.

methodological naturalism: The principle of science that holds that life is the result of natural processes in a system of material causes and effects that does not allow or need the introduction of supernatural forces. This fundamental concept is rejected by advocates of intelligent design.

Suggested Reading

Amicus curiae Brief in *Edwards v. Aguillard*.

Coyne, *Why Evolution Is True*.

Futuyma, *Science on Trial*.

Gilkey, ed., *Creationism on Trial*.

Godfrey, ed., *Scientists Confront Creationism*.

Gould, *Rocks of Ages*.

Grabiner and Miller, "Effects of the Scopes Trial."

Lindberg and Numbers, *God and Nature*.

Miller, ***Finding Darwin's God***.

Nelkin, *The Creation Controversy*.

Numbers, *The Creationists*.

Shermer, *Why Darwin Matters*.

Questions to Consider

1. What are the four stages of the evolution-creationism controversy from Darwin to the present?

2. Why do some faiths reject the theory of evolution while others accept it fully as God's way of creation?

3. What were the deeper implications for science and society of the Scopes "Monkey Trial"?

4. In the famous Louisiana creationism trial, what did the U.S. Supreme Court decide about whether or not creationism deserves equal time with evolution in public school science classes?

5. Does accepting the theory of evolution mean that one has to be an atheist?

Science, History, and Pseudohistory

Lecture 11

This lecture addresses the topic of bad history. Does this topic fit in with our exploration of skepticism and science? The answer is yes; a skeptical outlook is as important in guarding against bad history as it is in countering the claims of pseudoscience. Bad history not only misinforms us about our past, but as we'll see, it can also be used by people who have their own agendas to distort our understanding of the present. For that reason, history's findings, like those of science, must always be subjected to careful and ongoing analysis.

Convergence of Evidence

- The primary method that both historical scientists and historians use to deduce what happened in the past is **convergence of evidence**, in which multiple lines of evidence are tracked to see whether they converge toward one common conclusion or show no pattern at all.

- Cosmologists, for example, reconstruct the history of the universe through a convergence of evidence from cosmology, astronomy, astrophysics, spectroscopy, general relativity, and quantum mechanics. Geologists reconstruct the history of the Earth through a convergence of evidence from geology, geophysics, and geochemistry.

- Traditional historians do something similar: They weave a narrative tapestry of a historical time or event from diaries, letters, memos, receipts, manuscripts, newspaper reports, magazine articles, contemporary books, photographs, radio and television broadcasts, and other modes of communication.

- Even though the inferential sciences and history itself don't fit the model of experimental laboratory sciences, researchers in these fields can still test hypotheses. The field of biblical archaeology, for example, searches for data to confirm or refute stories in the Bible.

- One popular story that has been tested and so far failed all tests is that of the lost continent of Atlantis. This story, which comes to us through the writings of Plato, is a good introduction to the stark differences between history and **pseudohistory**, as well as those between science and pseudoscience.
    - The tale of Atlantis appears in the Socratic dialogue *Timaeus*. Plato's dialogist, Critias, explains that Egyptian priests told the Greek wise man Solon that his ancestors once defeated a mighty empire called Atlantis, located just beyond the "Pillars of Hercules" (usually identified by Atlantologists as the Strait of Gibraltar). After the defeat, the island of Atlantis was said to have disappeared into the sea.

    - Many people have claimed to have found the lost continent, but no convincing evidence has ever been presented that it even existed. It seems likely that Plato created the story as a warning to his fellow Athenians against becoming too warlike and corrupt.

- The story of Atlantis is just one of many **alternative histories**, usually offered by those who do not follow the scientific protocols of historians and archaeologists. Instead, they propose pictures of antiquity that are more like science fiction or fantasy.

Scientific History versus Pseudohistory

- As in the fields of science, hypotheses in history are formulated and then checked for consistency and accountability with available evidence. Conclusions are provisional and continually checked against new evidence.

- In contrast, alternative historians typically distort the process to fit their beliefs in a number of ways: (1) presenting only evidence that fits a preconceived belief and ignoring evidence that doesn't fit, (2) highlighting anomalies while ignoring the vast body of non-anomalous evidence, (3) taking evidence out of context, (4) overusing speculation and conjecture, and (5) assuming that if

scientific historians cannot explain something, then the alternative historian's theory must be correct.

- Alternative historians and archaeologists also make a number of mistakes in thinking that lead them down the path from history to pseudohistory. These mistakes include the following:
    - Hyper-diffusionism of people beyond their capabilities or motivations. Alternative histories typically have people traveling all over the world, using technologies and knowledge not available in their time.

    - Denial of independent discovery or invention of tools, pottery, art, and masonry. Alternative historians tend to think that if two tools (such as axes), architectural designs (such as pyramids), or works of art (such as statues) are similar, that must mean that two different people made contact with each other in the distant past. But given the simplicity and ordinariness of most of these tools and structures, that is not necessarily the case.

    - Denial of the possibility of independent similarity of words, symbols, and language sounds. Again, there are only so many variations on a theme in human symbols, sounds, and words, and the fact that two symbols or words appear similar to us does not necessarily mean that they represent ancient contact.

    - Misinterpretation of natural markings on rocks for human inscriptions or misinterpretation of human doodlings for inscriptions. People like to draw things that are important in the environment, and naturally, this includes large animals; of course, drawings of, say, European and North American species may vaguely resemble each other. Further, we should never underestimate the capacity of people to aimlessly doodle; some ancient "inscriptions" may, in fact, mean nothing.

    - Acceptance of fakes and hoaxes. Never discount intentional deception, particularly for financial gain, which can be substantial when dealing with ancient art and statuary.

Holocaust Denial: The Dark Side of Pseudohistory

- The problem with studying human history is that it has an additional layer of emotion and bias because it is about "us," and we all like to spin narratives to make ourselves look good and the other guy look bad.

- As well, there is a cognitive bias called the **curse of knowledge**, in which better-informed people find it difficult to think about problems from the perspective of lesser-informed people. Once you know something, you can't un-know it, and knowing it influences how you interpret it.
  - This is a problem for historians. Once you know the outcome of, say, the First or Second World War, it's hard not to see the "inevitability" of the outcome going all the way back to the beginning, but of course, the players in the drama had no such hindsight.

  - This is why historical revisionism is different from historical denial or pseudohistory. Historians may legitimately revise their views of history based on new evidence or other factors.

- Holocaust deniers have a different agenda than historians. Their aim is to minimize the political standing of Israel, reduce the influence of Jews in America, and in general, remove any moral leverage associated with having suffered genocide. They do not seek to better understand what happened during the Holocaust but to rewrite the past for present personal and political reasons.

- Holocaust deniers attack the three central tenets that define the Holocaust:
  - The Nazis intended to carry out genocide based primarily on race. To this, the deniers respond that there was no Nazi policy to exterminate European Jewry. The Final Solution to the "Jewish question" was deportation out of the Reich. Because of early successes in the war that allowed Germany to expand its borders, the Reich was confronted with more Jews than it could deport. Because of later failures in the war in key battles

with the Allies, the Nazis confined Jews in ghettos and, finally, concentration camps.

- The Nazis carried out a highly technical, well-organized extermination program using gas chambers and crematoria, along with other killing methods. To this central fact, Holocaust deniers respond that the main causes of death were disease and starvation, brought on primarily by Allied destruction of German supply lines and resources at the end of the war. Gas chambers were used only for delousing clothing and blankets, and the crematoria were used only to dispose of the bodies of people who had died from disease, starvation, or other causes.

- An estimated 5 to 6 million Jews were killed. Holocaust deniers claim that 300,000 to 2 million Jews died or were killed in ghettos and camps.

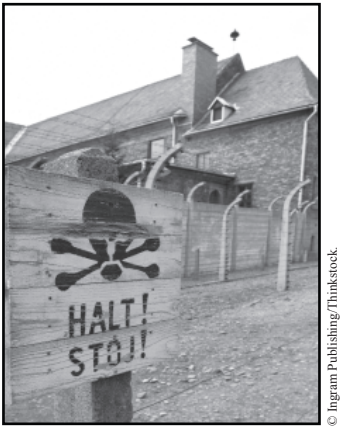
- Scientific historians address these claims as follows:
  - In any historical event, functional outcomes rarely match original intentions, which are always difficult to prove; thus, historians should focus on contingent outcomes more than intentions. The functional process of carrying out the Final Solution evolved over time, driven by such contingencies as increasing political power, growing confidence, the unfolding of the war, and so on. The outcome was millions of Jewish dead, whether extermination of European Jewry was explicitly ordered or just tacitly approved.

  - Physical and documentary evidence corroborates that the gas chambers and crematoria were mechanisms of extermination.

  - The estimate of 5 to 6 million killed is general but well substantiated. The figures are derived by calculating the number of Jews reported living in Europe, transported to camps, liberated from camps, killed in *Einsatzgruppen* actions, and alive after the war.

Alternative History versus Good Historical Science

- Methodologies of Holocaust deniers and other alternative historians include the following:
  - Alternative historians concentrate on their opponents' weak points, while rarely making definitive statements about their own positions. Deniers emphasize the inconsistencies among eyewitness accounts, for example.
  - Alternative historians exploit errors made by scholars who make opposing arguments, implying that because a few of their opponents' conclusions were wrong, all such conclusions must be wrong.
  - Alternative historians and deniers use quotations, usually taken out of context, from prominent mainstream figures to buttress their own positions.
  - Deniers mistake genuine, honest debates between scholars about certain points within a field as disputes about the existence of the entire field.
  - Finally, deniers focus on what is not known and ignore what is known, emphasize data that fit and discount data that do not fit.



© Ingram Publishing/Thinkstock.

Holocaust deniers concentrate on what we do not know about the gas chambers and disregard eyewitness accounts and forensic tests that support the fact that the gas chambers were used for mass murder.

- The book *Guns, Germs, and Steel* by UCLA scientist Jared Diamond serves as a positive example of the convergence-of-evidence method used in conjunction with the **comparative method**. The book

proposes a biogeographical theory to explain the differential rates of development between civilizations around the globe over the past 13,000 years.

Important Terms

alternative history: Claims about the past that are usually at odds with what mainstream professional historians have come to conclude about the past.

comparative method: A historical method of hypothesis testing wherein the historian examines natural experiments that took place in history with an eye toward finding similarities and differences to explore similar or different outcomes.

convergence-of-evidence method: Sometimes called the "consilience of inductions," this is the process of examining converging evidence from multiple lines of inquiry to determine whether it leads to a single conclusion.

curse of knowledge: A cognitive bias in which better-informed people find it difficult to think about problems from the perspective of lesser-informed people. Once we know something, we can't un-know it, and knowing it influences how we interpret it.

pseudohistory: A type of pseudoscience in which practitioners appear to use the rigorous methods of scientific history but, in fact, selectively choose to present only limited evidence in support of a particular belief about the past.

Suggested Reading

Fagan, *Archaeological Fantasies*.

Feder, *Frauds, Myths, and Mysteries*.

Fritze, *Invented Knowledge*.

Shermer, *Denying History*.

Steibing, *Ancient Astronauts, Cosmic Collisions, and Other Popular Theories about Man's Past.*

Williams, *Fantastic Archaeology*.

Questions to Consider

1. Was there a lost continent of Atlantis?

2. Who really discovered America?

3. How do we know that the Holocaust happened?

4. How do we know that anything in the past happened?

5. Why do mainstream historians tend to be skeptical of alternative histories?

6. What is the comparative method in historical studies, and how is it used to test historical hypotheses?

The Lure of Conspiracy Theories

Lecture 12

In the last lecture, we saw how alternative historians rewrite the past to suit their present beliefs. One of their most common responses when asked why mainstream historians do not accept their accounts is that there is a vast conspiracy against them. In fact, conspiracy theorists have accused various groups of assassinating President Kennedy, have claimed that the Bush administration planned the 9/11 attacks, and most recently, have accused the Obama administration of executing the Sandy Hook Elementary School shootings as a pretense to abolish the Second Amendment. Such fantastical claims foment suspicion and could, under the right circumstances, cause political and social disruption. In this lecture, we'll look at conspiracy theories, an area in dire need of skepticism.

The Death of Princess Diana

- Within hours of Princess Diana's tragic death in an automobile accident in Paris, theories about what "really" happened to her began to proliferate. Those accused of conspiring to murder the princess included the pope and the American company DuPont; MI6 agents; Diana's boyfriend, Dodi Fayed (also killed in the accident); and many others.

- Two independent investigations concluded that the cause of Diana's death was not at all mysterious: drunk driving, speeding, and failure to wear a seatbelt. The proliferation of conspiracy theories surrounding her death would seem to stem from the idea that a princess is not supposed to die in the same way as normal people.

- Of course, some conspiracies are real, such as the one behind the assassination of President Lincoln, and while it may be easy to identify a real conspiracy with historical hindsight, it's not always so easy in the midst of rapidly unfolding events in real time. How can any of us know whether a conspiracy theory is true or false?

Conspiracies versus Conspiracy Theories

- Let's begin by distinguishing between a conspiracy and a conspiracy theory. A **conspiracy** takes place when two or more people meet or confer in secret to commit an illegal, treacherous, or evil act against a third party without the third party's knowledge or approval. A **conspiracy theory** is the belief in a conspiracy that may or may not be true.
  - The destruction of the World Trade Center on 9/11 was a conspiracy, plotted by 19 members of al-Qaeda.
  - The theory that the U.S. government orchestrated 9/11 as a pretense to war is a conspiracy theory, about which we should be extremely skeptical.

- The term "conspiracy theory" is often used derisively in newspaper columns, on talk shows, and in political debates to indicate that someone's explanation for an event is highly improbable or even on the lunatic fringe and that those who proffer such theories are most probably crackpots. But because conspiracies do happen, we cannot automatically dismiss any and all conspiracy theorists. What should we believe when we encounter a conspiracy theory?

The Conspiracy Theory Detector

- Remember the principle of the null hypothesis in science: We must assume that any theory or hypothesis we are investigating is false until proven otherwise. Thus, the default rule of thumb with conspiracy theories is that they are false.

- Conspiracy theories tend to show five characteristics indicating that they are very likely untrue:
  - There is an obvious pattern of connecting the dots of events that may or may not be connected in a causal way. Remember the concept of patternicity—the tendency to find meaningful patterns in random noise. When Osama bin Laden boasted about the triumph of 9/11, we could be confident that the pattern was real because we could follow the paper trail. But when there is no forthcoming evidence to support a causal

connection or when the evidence is equally well explained through some other causal chain—or through randomness—the conspiracy theory is probably false.

- The agents behind the pattern of the conspiracy are elevated to near superhuman power to pull off the conspiracy. We must always remember how flawed human behavior is and the natural tendency we all have to make mistakes. Most of the time, in most circumstances, most people are not nearly as powerful as we think they are.

- The more complex the conspiracy and the more elements involved for it to unfold successfully, the less likely it is to be true.

- The more people involved in the conspiracy, the less likely it is that they will all be able to keep silent about their secret activities.

- The grander and more global the conspiracy is believed to be and the more it is thought to encompass—the control of an entire nation, economy, or political system—the less likely it is to be true.

Why People Believe Conspiracy Theories

- Several psychological principles seem to be at work in promoting belief in highly improbable conspiracy theories. The first of these is patternicity. One reason people believe conspiracies is that they identify any and all patterns as real, with little to no screening of potentially false patterns.

- Another principle at work here is agenticity, the tendency to infuse patterns with intentional agents behind the scenes. Conspiracy theorists connect the dots of random events into meaningful patterns and then infuse those patterns with intentional agency—hidden forces at work that control the world.

- We can add to those propensities the confirmation bias that we discussed in an earlier lecture. Once we have an idea in our minds about something, we notice only evidence that confirms the idea and are blind to evidence that disconfirms it.

- Also in play is hindsight bias, in which we tailor after-the-fact explanations to what we already know happened.

- Yet another reason people believe in conspiracy theories is a psychological principle known as **cognitive dissonance**. When confronted with contradictory evidence for their beliefs, people don't change their beliefs; instead, they ratchet up the intensity of their beliefs to overcome the dissonance of being wrong. As we've seen, highly intelligent people are especially good at this kind of defense of their beliefs.

© Hemera Technologies/Photos.com/Thinkstock.

Belief in conspiracy theories can be explained in part by cognitive dissonance; it seems somehow inappropriate that John F. Kennedy, the leader of the free world, was assassinated by Lee Harvey Oswald, a nobody.

"Everything Happens for a Reason"

- It often seems that people who believe in one conspiracy theory tend to believe in many others. This tendency may stem from the belief that everything happens for a reason.

- This observation was recently confirmed empirically by psychologists at the University of Kent in a paper entitled "Dead and Alive: Beliefs in Contradictory Conspiracy Theories." According to the authors, once someone believes that "one massive, sinister conspiracy could be successfully executed in near-perfect secrecy, [it] suggests that many such plots are possible."

- With this worldview, conspiracies can become "the default explanation for any given event—a unitary, closed-off worldview in which beliefs come together in a mutually supportive network known as a monological belief system."
    - The term "monological" here means one elaborate narrative conspiracy that ties everything together. A **monological belief system** explains the correlations between different conspiracy theories in the study.

    - The authors further suggest that another process is at work here, **global coherence**, which overrules contradictions. They define global coherence as "the psychological propensity to believe that everything happens for a reason…."

Case Study in Conspiracy

- Conspiracies do happen, so we can't automatically dismiss them. The Austrian archduke Franz Ferdinand, for example, was gunned down by a Serbian secret society on June 28, 1914. This assassination triggered a military buildup over the summer that led to the outbreak of the First World War.
    - The assassination of Franz Ferdinand was organized by a secret radical organization called Black Hand, whose political objective was the independence of Serbia from the Austro-Hungarian Empire. The assassins were backed by an underground network of Serbian civilians and military officers who provided them with weapons, maps, and training to pull off the conspiracy.

    - The archduke, heir to the Austro-Hungarian throne, was in Sarajevo to observe military maneuvers and to open a new state museum. On the morning of his arrival, six assassins were posted at strategic locations in the city, but two failed to act, one hit the wrong target, and the other three slunk away in defeat.

    - Later in the day, one of the assassins emerged from a delicatessen where he had just eaten lunch and spotted the archduke's car. He shot Franz Ferdinand and his wife, Sophie.

- That is how conspiracies usually work; they are messy events that unfold according to real-time contingencies and often turn on the minutia of chance and the reality of human error. Our propensity to think otherwise—to believe that conspiracies are well-oiled machines of Machiavellian manipulations—is to fall into the trap of conspiratorial thinking, where the patterns are too well delineated and the agents superhuman in knowledge and power.

- Admittedly, conspiracy theories make for compelling narrative stories, and it may seem as if the skeptical perspective is less satisfying because it deals in hard facts instead of speculation, but in the end, we need skepticism because it is more important to be right than to be suspicious.

Important Terms

cognitive dissonance: The uncomfortable tension that comes from holding two conflicting thoughts at the same time.

conspiracy: When two or more people meet or confer in secret to act against a third party.

conspiracy theory: The belief in a conspiracy that may or may not be true. The events of 9/11 were the result of a conspiracy; by definition, 19 members of al-Qaeda plotting to fly planes into buildings without warning us ahead of time constitutes a conspiracy. The theory that the U.S. government orchestrated 9/11 is a conspiracy theory.

global coherence: The psychological propensity to believe that everything happens for a reason, there are no accidents, and that there is an overriding force or operation at work—either natural or supernatural—that ties together apparently discoherent events into one grand or global theory. In conspiracy theorizing, this often manifests as the New World Order.

monological belief system: A unitary, closed-off worldview in which beliefs come together in a mutually supportive network.

Suggested Reading

Achenbach, *Captured by Aliens*.

Goldwag, *Cults, Conspiracies, and Secret Societies*.

Nickerson, "Confirmation Bias."

Sagan, *The Demon-Haunted World*.

Shermer, *Denying History*.

Vankin and Whalen, *The Fifty Greatest Conspiracies of All Time*.

Wood, Douglas, and Sutton, "Dead and Alive."

Questions to Consider

1. What is the difference between a conspiracy and a conspiracy theory?

2. Given that some conspiracy theories turn out to be real, what criteria should we use to tell the difference between a true conspiracy theory and a false one?

3. Which of the most popular conspiracy theories do you think are most likely to be true—those surrounding President Kennedy's assassination, Princess Diana's death, 9/11, or a government cover-up of aliens and UFOs?

4. What is a monological belief system, and what has it to do with conspiracies?

5. Why do people tend to believe contradictory conspiracy theories?

Inside the Modern Cult

Lecture 13

This lecture explores how the power of belief can override our rational minds and lead us into something even more potentially dangerous than the conspiracy theories we saw in the last lecture—cults. According to sociologists and anthropologists of religion, a cult is a group with novel religious beliefs and a high degree of tension with the surrounding society; a sect also experiences that tension but has traditional religious beliefs. A cult may either die out or become a sect, which may itself either die out or become a mainstream religion. Our concern in this lecture is dangerous cults, such as the Branch Davidians, Heaven's Gate, the Peoples Temple of Jim Jones, and even Charles Manson's Family.

Heaven's Gate: A Case Study in Cults

- Heaven's Gate was founded by Marshall Applewhite and Bonnie Nettles in 1975. The pair had come to believe that they had arrived on Earth via a UFO from another dimension above the human.
    - Members of the cult sold their possessions and lived in isolation from their friends and families. Because sex was considered evil, six male members voluntarily underwent castration.

    - In 1997, the appearance of Comet Hale-Bopp attracted the attention of Heaven's Gate. The members came to believe that suicide would allow their souls to join the mothership that they thought was hiding behind the comet. The chilling "final exit" speech by Marshall Applewhite was filmed on March 19, 1997. One week later, on March 26, police found 39 members dead in a rented mansion in Rancho Santa Fe, California.

- How is it possible to get normal people to sell all their possessions, castrate themselves, and take their own lives? To understand how these things can happen, we need to get into the mind of the cultists and look more closely at the psychology of **cults**.

The Psychology of Cults

- A number of psychological factors go into the process of becoming a cult member. As we go through these factors, consider how each of them operates to break down the ability and willingness to think for oneself—the foundation of skepticism.

- Gradual progression with good intentions: No one joins a "cult." People join an organization with lofty goals and good intentions that gradually slides into something very different from what was apparent at the start.
    - The handful of survivors of the mass suicide in the Jonestown cult in the South American jungles of Guyana, for example, later reflected on the wonderful organization they had originally joined in San Francisco, in which their leader, Jim Jones, worked closely with community leaders to help the poor and needy.

    - It took many years for Jim Jones's madness to develop, and his control over his followers increased one small increment at a time, until he exerted almost total control over the group.

- **Obedience to authority**: In July of 1961, Yale University psychologist Stanley Milgram began his famous experiments to investigate obedience to authority. Subjects were asked to administer progressively stronger electric shocks to "learners," who were actually accomplices of the researcher.
    - Despite predictions of psychiatrists that only 1 percent of subjects would administer the strongest shock, in fact, 65 percent did so.

    - Milgram found that gender, age, occupation, and personality characteristics mattered little in the results, but physical proximity and group pressure did.

- Role playing: We all play different roles in our lives that change depending on the environment. Milgram's subjects were not playing the role of sadistic perpetrators shocking innocent victims;

they were playing the role of teachers helping people learn in a memory experiment, all in the name of science. Only when the role called for the gradual escalation of punishment was good behavior transformed into evil. In such small increases, we can lose touch with reality and fail to recognize when we've crossed a moral line.

Characteristics of Cults

Cults may exhibit a number of common characteristics, including the following:

- Veneration of the leader
- Belief in the inerrancy of the leader
- Belief in the omniscience of the leader
- Discouragement of dissent
- Belief that the leader or group has a method of discovering absolute truth
- Development of a system of absolute morality that is believed to be applicable to both members and nonmembers
- In-group/out-group mentality
- A viewpoint that the ends justify the means, leading members to do things they would have considered reprehensible or unethical before joining the group
- Hidden agendas, that is, beliefs and plans that are not disclosed to potential recruits and the public
- Deceit of recruits and followers, particularly with regard to the leader or the group's inner circle

- Financial and/or sexual exploitation
- Mind-altering practices, such as meditation, chanting, denunciation sessions, and debilitating work routines
- Lack of accountability
- Isolation from friends and families
- Aggressive recruitment practices
- Persuasive techniques used to recruit new members and reinforce current beliefs.

Note that exhibiting any one of these characteristics does not mean that a group is a cult, and no cult shows all of these characteristics.

- **Deindividuation**: Removing individuality by taking people out of their normal social circles (as cults do), dressing them in identical uniforms (as the military does), or insisting that they be "team players" (as corporations often do) sets up a situation for remolding their behavior in the direction the leader wishes. The **conformity** that results can produce impressive achievements, such as persuading soldiers to risk their lives in battle, but when people stop thinking skeptically for themselves, bad things can happen.
    - In 1954, the social psychologists Muzafer and Carolyn Sherif conducted a now-classic experiment at a Boy Scout camp at Robbers Cave State Park in Oklahoma, in which they divided 11-year-old boys into two groups and had them compete in various tasks over the course of a few days. Despite preexisting friendships between many of the boys, hostilities quickly developed along group identity lines.

- Acts of aggression escalated to the point where the researchers were forced to terminate this phase of the experiment early and introduce tasks for the boys that required cooperation between the two groups, which just as quickly led to renewed friendships and between-group amity.

- **Dehumanization**: The processes of role playing and deindividuation also set the stage for dehumanizing the "other." It's relatively rare for people to commit evil deeds against those whom they consider to be fellow in-group members, but in-groups are defined by their out-group counterparts, and out-groups reinforce the power of the in-group.

- Compliance: This factor involves outward apparent conformity by individuals to new group norms or an authority's commands, even when these individuals have not actually internalized the beliefs as their own. In other words, they are playing the role or obeying authority even though they do not actually believe what they are doing is right.
  - In an experiment conducted in a hospital in 1966, the psychiatrist Charles Hofling arranged to have an unknown physician contact nurses by phone and order them to administer 20 mg of a nonexistent drug to one of his patients. Not only was the drug fictional, but it was not on the approved list of drugs and the bottle clearly indicated that 10 mg was the maximum daily dose allowed.

  - Pre-experimental surveys showed that when given this scenario as a hypothetical, virtually all nurses and nursing students said they would disobey the order. Yet when Hofling actually ran the experiment, 21 out of 22 nurses complied with the doctor's orders, even though they knew that doing so was wrong.

- **Identification**: Related to conformity is identification, or the close affiliation with others of like interest. Our social groups provide us with a frame of reference, or norms, with which we can identify,

and any member of the group who strays from those norms risks disapproval, isolation, or expulsion.

- In a longitudinal study in the 1930s at Bennington College in Vermont, psychologist Theodore Newcomb tracked the changing political attitudes of a group of entering female students who were self-identified as conservative and whose parents voted Republican. In the course of four years, their politics shifted distinctly left to match those of their more liberal classmates and professors, who became their new reference group.

- Of course, the influence of college on our political opinions is a far cry from that of cultists, but the point is that there is a normal psychology of belief that allows for outside influences that is then capitalized on by cult leaders who are skilled at manipulation.

- Well-known examples of identification include the experience of Patty Hearst with the Symbionese Liberation Army in the 1970s and that of Elizabeth Smart, kidnapped from her home in 2002 by Mormon fundamentalist Brian David Mitchell.

- **Conformity**: Because we evolved to be social beings, we are hypersensitive to what others think about us and are strongly motivated to conform to the social norms of our group. Solomon Asch's famous 1951 study on conformity involving the judgment of line lengths demonstrated the power of groupthink. Much later brain-scan studies have even identified which parts of the brain are active under conformity versus nonconformity.

- Diffusion of responsibility: Evil persists when responsibility is diffused among others and group members assume that someone else is minding the store or resolving the problem. For example, numerous people at the Abu Ghraib prison knew about the torture and abuse of prisoners, but only one man, Joseph Darby, ultimately blew the whistle.

- **Social facilitation**: The field of psychology recognizes a phenomenon known as social facilitation—the tendency of people who are engaging in similar behavior to spur one another on. When order breaks down and the normal institutional brakes on evil are lifted, evil is facilitated through the contagious excitement of the group's actions.

- Pluralistic ignorance: Finally, the psychological principle known as pluralistic ignorance may also be at work in cults and other groups. Here, individual group members don't believe something but mistakenly believe that everyone else in the group believes it. When no one speaks up, a "spiral of silence" can result that leads to everything from binge drinking to witch hunts to deadly ideologies.

- All these psychological factors operate within a larger evolved propensity we have to divide the world into tribes of us versus them. Results of social psychological studies suggest that this tribalism is inherent; by nature, we want to belong. That makes the job of any cult that wants to snare us much easier than we would like to think.

Evil Incorporated

- When we put all these factors together, we get a deadly cocktail that poisons our ability to reason: Dehumanization produces deindividuation, which then leads to compliance under the influence of obedience to authority. In time, that compliance morphs into conformity to new group norms, identification with the group, and ultimately, the social facilitation that leads to the performance of evil acts, especially if pluralistic ignorance runs rampant through the group.

- No one of these components inexorably leads to evil acts or defines a group as a cult, but together, they form the machinery of evil that arises under certain social conditions. This is what happened on November 18, 1978, in the jungles of Guyana, when Jim Jones, leader of the Peoples Temple cult, ordered the mass suicide of his own followers by inducing them to swallow a cyanide-laced drink.

- Note that at each step along the route to evil, thinking for oneself offers an antidote. We can spot an organization's decline from lofty goals to madness if we pay attention. We can refuse to obey authority. We can stay true to ourselves, even when playing a role or joining a team. We can refuse to accept the dehumanization of others and refuse to do what we believe is wrong. In short, we can exercise our ability to reason and to choose.

Important Terms

conformity: The internalization of a group's beliefs to the point where they become one's own.

cult: A religious group with novel religious beliefs and a high degree of tension with the surrounding society.

dehumanization: The process of removing the humanity of people by treating them as "others"—so different from everyone we know that they must be effectively strangers, perhaps not even human.

deindividuation: The process of removing people's individuality by taking them out of their normal social circle of family and friends, dressing them in identical uniforms, or insisting that they be team players or go along with the program.

identification: The close affiliation with others of like interest, as well as the normal process of acquiring social roles through modeling and role playing.

obedience to authority: The blind following of a leader or authority figure that leads people to commit acts they would not otherwise engage in.

social facilitation: When the normal institutional brakes on behavior are lifted, evil acts may be facilitated through the contagious excitement of the group's actions.

Suggested Reading

Allen, "The Jesus Cults."

Cialdini, *Influence*.

Goldwag, *Cults, Conspiracies, and Secret Societies*.

Hassan, *Releasing the Bonds*.

Milgram, *Obedience to Authority*.

Sherif et al., *Intergroup Conflict and Cooperation*.

Zimbardo, *The Lucifer Effect*.

Questions to Consider

1. Have you ever joined an organization that became a cult, or have you known someone who did? Can you see any of these social psychological factors at work in the process of someone getting deeper into the organization?

2. What is cognitive dissonance, and how does it lead people to become even firmer in a belief when the evidence for it declines or disappears entirely?

3. How is a cult defined colloquially and scientifically?

4. What are the chief characteristics of a cult?

5. Do you think you would go all the way to 450 volts in Stanley Milgram's famous shock experiment? If not, why not?

The Psychology of Religious Belief

Lecture 14

According to the *World Christian Encyclopedia*, 84 percent of the world's population belongs to some form of organized religion, which equals about 5.9 billion people. In America, a Pew Forum survey found that 82 percent believe in God or a universal spirit. From a skeptic's and a scientist's perspective, such percentages of belief cry out for an explanation. What human need does religion serve? Why do so many people believe in God—however they may define that term—or in some kind of higher power? In this lecture and the three that follow, we'll consider what skepticism and science can tell us about the most serious of all issues: God, morality, and the afterlife.

Why Do People Believe in God?

- One answer to the question of why people believe in God is that our brains are wired to find God-like patterns and agents everywhere we look.
    - In a previous lecture, we discussed the concepts of patternicity and agenticity. Recall that patternicity is the tendency to find meaningful patterns in both meaningful and meaningless noise, and agenticity is the tendency to infuse those patterns with invisible intentional agents operating in the world.

    - These tendencies are most likely adaptive products of evolution. Creatures that did not find meaningful patterns or attribute agency to the wind in the grass often ended up as a meal, and their genes were not passed on.

- In this cognitive model, God—or, at least, the Judeo-Christian God—is the ultimate pattern that explains everything that happens, from the beginning of the universe to the end of time, including and especially the fates of human lives. God is also the ultimate intentional agent who gives the universe meaning and our lives purpose.

- More broadly, as an ultimate amalgam, patternicity and agenticity could form the cognitive basis of shamanism, paganism, animism, polytheism, monotheism, and all other forms of theisms and spiritualisms devised by humans.

Evolutionary Theory and God

- From an evolutionary standpoint, we can define **religion** as a social institution to create and promote myths, to encourage conformity and altruism, and to signal the level of commitment to cooperate and reciprocate among members of a community. Given the need for the social benefits that religion provides, how might it have come about in human history?

- It's possible that around 5,000 to 7,000 years ago, as tiny bands and tribes of people began to coalesce into large chiefdoms and states, government and religion coevolved as social institutions to codify moral behaviors into ethical principles and legal rules. God or gods became the ultimate enforcers of those rules.
    - In the small populations of hunter-gatherer bands and tribes, informal means of behavior control and social cohesion could have been used by capitalizing on the moral emotions, such as shaming someone through guilt for violating a social norm or even excommunicating violators from the group. But when populations grew larger, such informal means of enforcing societal rules may have broken down. Something more formal was needed.

    - Governments outlined rules in the form of laws and established punishments for violations of those laws. Religion, whether it was designed for this purpose or evolved into its role, presented the rules in the form of ethical commandments and, in some cases at least, warned of punishments for violators in the next life.

- Further evidence for the evolutionary origins of religion and belief in God can be found in anthropological studies of meat sharing practiced by all modern hunter-gatherer societies around the world.

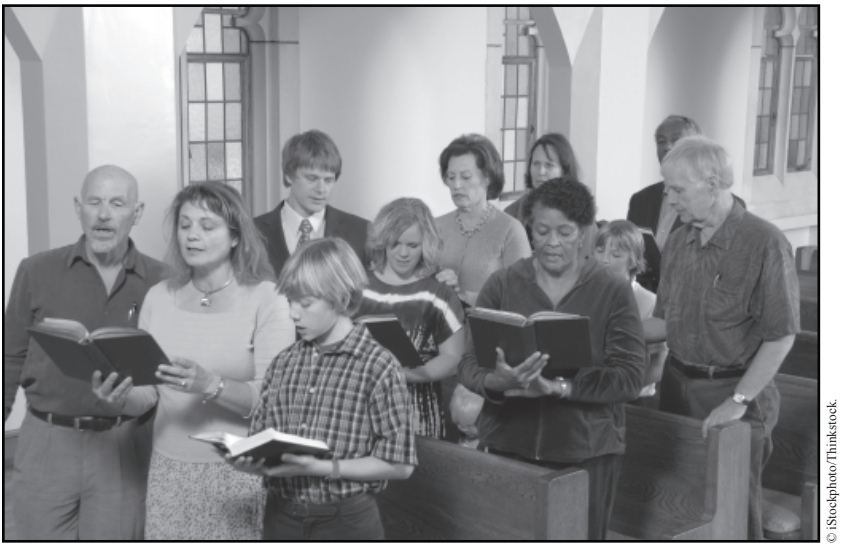
- These small communities—which can cautiously be used as a model for our own Paleolithic ancestors—are remarkably egalitarian. The immediate families of successful hunters get no more meat than the rest of the families in the group.

- In hunter-gatherer groups, individual selfish acts are effectively counterbalanced by the combined will of the rest of the group through the use of gossip to ridicule, shun, and even ostracize individuals whose competitive drives and selfish motives interfere with the overall needs of the group.

- Thus, as the anthropologist Christopher Boehm argues in his 1999 book, *Hierarchy in the Forest: Egalitarianism and the Evolution of Human Altruism*, a human group is also a moral group, in which "right" and "wrong" coincide with group welfare and self-serving acts, respectively.

- Elaborate rituals surrounding the enforcement of altruism and moral behavior often entail belief in supernatural beings and superstitious practices, as seen in the Chewong people of the Malaysian rain forest and the ritual of food sharing known as *punen*. Such rituals and beliefs evolved to reinforce group cohesiveness and moral behavior.

- In his latest book, *Moral Origins*, Boehm shows how these hunter-gatherer groups handle the free-riding problem of extreme bullies and super-selfish individuals with sanctions that range from social pressure and criticism to shaming, ostracism, ejection from the group, and even capital punishment.

- These examples suggest that one's culture may dictate which god or religion to believe in, but the belief in a supernatural agent who operates in the world as an indispensable part of a social group is universal to all cultures because it is hardwired in the brain.

© iStockphoto/Thinkstock.

In their studies, behavioral geneticists look at such measures of religious belief as rates of church attendance, regularity of prayer, and intensity of God beliefs.

Behavior Genetics and God

- Genetic research offers a second line of evidence about belief in the divine. **Behavior genetics** is the science of teasing apart the relative roles of heredity and environment in any given behavior.

- In a 1979 study of 53 pairs of identical twins and 31 pairs of fraternal twins reared apart, researchers in the Minnesota Twins Project looked at five measures of religiosity. They found that the correlations between identical twins were typically double those for fraternal twins. Subsequent analysis led them to conclude that genetic factors account for 41 to 47 percent—almost half—of the observed variance in their measures of religious beliefs.

- Two much larger twin studies in 1986 support this conclusion. These studies found similar percentages of genetic influence on religious beliefs, comparing identical and fraternal twins on numerous measures of beliefs and social attitudes, initially concluding that

approximately 40 to 50 percent of the variance in religious attitudes was genetic.

- These twin researchers also documented substantial correlations between the social attitudes of spouses, evidence of the phenomenon known by evolutionary theorists as **assortative mating**, or "like seeks like."

- Assortative mating means that children receive a double dose of similar genes. When these researchers included a variable for assortative mating in their behavioral genetics models, they found that approximately 55 percent of the variance in religious beliefs is genetic.

- These behavior genetics studies indicate that people who grow up in religious families and themselves later become religious may do so in significant part because they have inherited a disposition, from one or both parents, to resonate positively with religious beliefs.

- Of course, genes do not determine whether one chooses Judaism, Catholicism, Islam, or any other religion. Rather, belief in supernatural agents and commitment to certain religious practices appear to reflect genetically based cognitive processes (inferring the existence of invisible agents) and personality traits (respect for authority, traditionalism).
  - In other words, genes code for personality and temperament, and by personality and temperament, we find ourselves gravitating toward certain people and groups whom we enjoy being around and whose beliefs we share.

  - If your parents are religious and they raised you in a religious home, you are that much more likely to be religious yourself and end up in the particular religion you happened to have been raised in.

- A controversial hypothesis put forth by the geneticist Dean Hamer is that a gene called **VMAT2** (vesicular monoamine transporter 2),

which regulates the flow of serotonin, adrenaline, norepinephrine, and dopamine in our brains, may make people feel good about being spiritual or religious.

- VMAT2 is an integral membrane protein that acts to transport monoamines from the fluid inside the neuron cell body to the synaptic vesicles at the ends of the neuronal dendrites.

- Hamer thinks that one variant of the VMAT2 gene that is associated with increased self-transcendence (a personality trait that encompasses self-forgetfulness, transpersonal identification, and mysticism) leads to the production of more of these transporters; thus, more neurotransmitter substances, such as dopamine, are delivered into the synapses, thereby boosting positive feelings.

- Hamer's studies have been strongly criticized by his fellow scientists, and admittedly, identifying genes for specific behaviors or beliefs can be problematic. Nevertheless, the fact that dopamine is involved in belief supports the thesis that there is a belief engine in the brain and one role of this engine is to reward belief of all putative claims, including belief in God. In other words, it feels good and is rewarding to believe in God.

Comparative World Religions and God

- A line of evidence that supports the cultural side of religious and god beliefs comes from the study of comparative world religions. Over the past 10,000 years of history, humans have created thousands of different religions and gods. The propensity for humans to believe in gods and adhere to religious faiths may have a strong genetic component, but culture also strongly shapes how we think about God and religion.

- We can see the cultural element in religious beliefs in the similarities among flood, virgin birth, and resurrection myths throughout history.
  - For example, predating the biblical Noahian flood story by centuries is the Epic of Gilgamesh, written about 1800 B.C.

In fact, many cultures that developed along the banks of rivers and seas have flood myths as part of their histories.

- Virgin birth myths likewise spring up throughout time and geography. Among those alleged to have been conceived in this way were: Dionysus, Perseus, Buddha, Attis, Krishna, Horus, Mercury, Romulus, and of course, Jesus. Consider the parallels between Dionysus, the ancient Greek god of wine, and Jesus of Nazareth.

- Resurrection myths are no less culturally constructed. Osiris is the Egyptian god of life, death, and fertility and is one of the oldest gods for whom records have survived. Osiris first appears in the pyramid texts around 2400 B.C. By the time of the New Kingdom in Egypt, both pharaohs and mortal men believed that they could be resurrected by and with Osiris at death if they practiced the correct religious rituals.

- Of course, believers in God may respond that this scientific and historical research does not prove or disprove God's existence. Perhaps God designed our brains in this way so that we may better know him. We'll look at this and other arguments for and against God's existence in the next lecture.

Important Terms

assortative mating: The idea that like marries like. People are attracted to other people who are similar to them in looks and beliefs, and this leads to offspring who are similar to their parents in both genetics and upbringing.

behavior genetics: The study of the relative roles of nature and nurture, genetics and environment, biology and culture, primarily through the use of twin studies, most notably, twins who were separated from birth and raised in separate environments.

religion: A social institution to create and promote myths, to encourage conformity and altruism, and to signal the level of commitment to cooperate and reciprocate among members of a community.

VMAT2 gene: Associated with increased self-transcendence, this gene is believed by some scientists to lead people to find pleasure in spiritual activities, such as prayer, meditation, chanting, singing, and other religious rituals.

Suggested Reading

Eliade, *The Sacred and the Profane*.

Evans-Pritchard, *Theories of Primitive Religion*.

Hamer, *The God Gene*.

Shermer, *How We Believe.*

Stark and Bainbridge, *A Theory of Religion*.

Questions to Consider

1. Before listening to this lecture, how would you answer these two questions: (1) Why do you believe in God? (2) Why do you think other people believe in God?

2. Do you think that belief in God and participation in religious faiths is hardwired into our brains, or do you think it is an artifact of culture and history? Or both?

3. How do you make sense of the fact that there are so many different religions in the world, most of which make truth claims that are in conflict with other religions that also make truth claims? Is one of them right and the others wrong, or is there no religious "truth"?

The God Question

Lecture 15

Because we live in an age of science, many people are not content to believe in God on faith alone, and over the centuries, this has led philosophers to construct a series of arguments for God's existence based on reason and logic. Other philosophers have countered these arguments, also using reason and logic, while scientists have largely stayed out of the debate until just recently, when some believing scientists have argued for God's existence through science-based claims. This lecture examines the best arguments for and against God's existence to enable you to answer the question for yourself.

Arguments for and against God's Existence

- For the sake of brevity, let's focus on the Christian conception of **God**. Believers in the industrial West usually mean God to be: all powerful, all knowing, all good, one who created the universe and everything in it out of nothing, one who is uncreated and eternal, a noncorporeal spirit, and one who created, loves, and can grant eternal life to humans.

Theist Argument	Atheist Counterargument
Prime mover and **first cause** (put forth by the Catholic theologian and philosopher Saint Thomas Aquinas in the 13th century): Everything in the universe is in motion and has a cause. Nothing can be in motion unless it is moved by another, and all effects in the universe have causes. But this motion and cause-and-effect sequence cannot be regressed forever; thus, there had to be a prime mover and first cause, a causal agent who needed no other cause to create the universe and set it in motion.	If the universe is defined as everything that is, ever was, or ever shall be, God must be within the universe or is the universe. In either case, God would himself need to be caused and moved; the regress to a prime mover and first causer begs the question of what moved and caused God. Theists may respond that God does not need to be moved and caused, but if that's true, then not everything in the universe needs to be moved and caused. Perhaps the initial creation of the universe was its own prime mover, and perhaps the universe itself does not need a cause.

Theist Argument	Atheist Counterargument
Miracles: The miracles of the Bible, as well as those of modern times, cannot be accounted for by science or natural law; therefore, they must have as their cause a higher power—God.	A miracle is just a name for something we cannot explain. This is the "God of the gaps" argument discussed in an earlier lecture.
Pascal's wager (formulated by the French philosopher Blaise Pascal): If we wager that God does not exist and he does, then we have everything to lose and nothing to win. If we wager that God does exist and he does, then we have everything to gain and nothing to lose.	First, this is not actually a proof of God because Pascal himself admitted that one still needs faith. Second, believing in God and going through the motions of attending church, praying, taking the sacraments, and so forth is not a case of "nothing to lose." At the very least, one loses the time and effort required for these activities when one could be doing something else. Finally, Pascal applied his wager to the Judeo-Christian God, but what if there were some other god or a higher intelligence even more powerful than God, and you were punished for wagering on the wrong god and religion?
Morality: Humans are moral beings and animals are not. We got this moral drive through the ultimate moral being—God. Without God, there would be no objective standard for morality and, thus, no reason to be moral. Murder, for example, is wrong because God commanded it so, but without God, some cultures might hold murder to be wrong while others do not, reducing morality to pure anything-goes relativism.	This argument entails two questions: (1) What is the source of our morality, and (2) can there be objective right and wrong without God? For the first question, there is strong scientific evidence that humans evolved morality and a sense of right and wrong because we are a social species and need to get along in groups. But if God is the author of the laws of nature and evolution entails some of those laws in action, then one could argue that God used evolution to create the moral sense in humans. As for the second question, moral realists and moral consequentialists both argue that moral principles exist whether or not there is a God. For example, truth telling is a moral principle because honesty is vital for human relationships. This would be true whether or not God exists. The same is true of murder, adultery, and other moral issues.

- Using this definition, the following table outlines the best arguments for this God's existence put forth by theists and the counterarguments given by atheists.

Theist Argument	Atheist Counterargument
Design/teleology (first proffered by Aquinas but refined by later thinkers): Aquinas wrote, "natural bodies act for an end," yet because they lack knowledge, they must have been designed. "Therefore some intelligent being exists by whom all natural things are ordered to their end; and this being we call God." Modern design arguments involve the intricacies of design in nature, such as symbiotic relationships between organisms or the apparent "anthropic" design of the cosmos—that is, that it is precisely suited for life.	Nature is not as beautifully designed or as "perfect" as it might seem. Most of the universe, for example, is completely inhospitable to life. Further, nature is filled with oddities that do not seem intelligently designed and, in fact, point to bottom-up, unguided evolution. But this counterargument is incomplete; theists are actually arguing that the laws of nature are such that no life forms of any kind could exist if these laws were different in any manner. In fact, matter itself couldn't exist without the laws of nature being finely tuned.

The Anthropic Principle

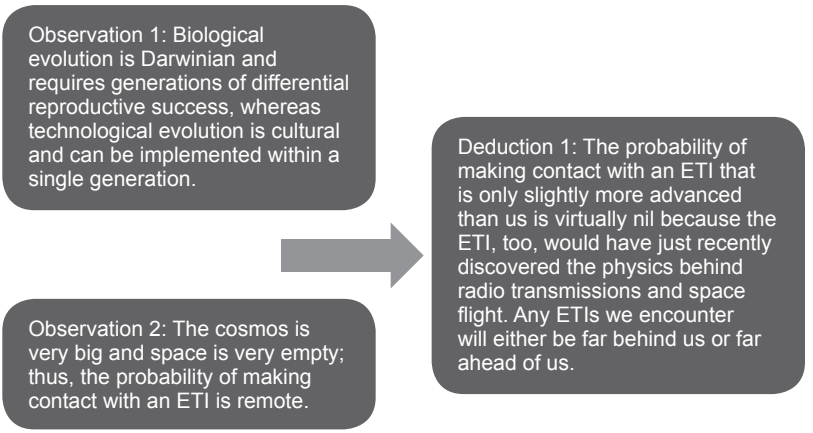
- There are three types of **anthropic principles**:
  - Weak: the belief that the universe and the laws of nature must be configured as they are or else we wouldn't be here to observe them.
  - Strong: the belief that the universe and the laws of nature must be configured as they are because there is no other way they could be structured.
  - Final or participatory: the belief that the universe and the laws of nature must be configured as they are because humans are inevitable, and once we exist, we participate in the universe to preserve our existence.
- But scientists have come up with numerous ideas to explain the origin of the universe. These ideas include an as-yet-unknown grand unified theory that connects quantum mechanics to general relativity, various theories of multiverses, and others.

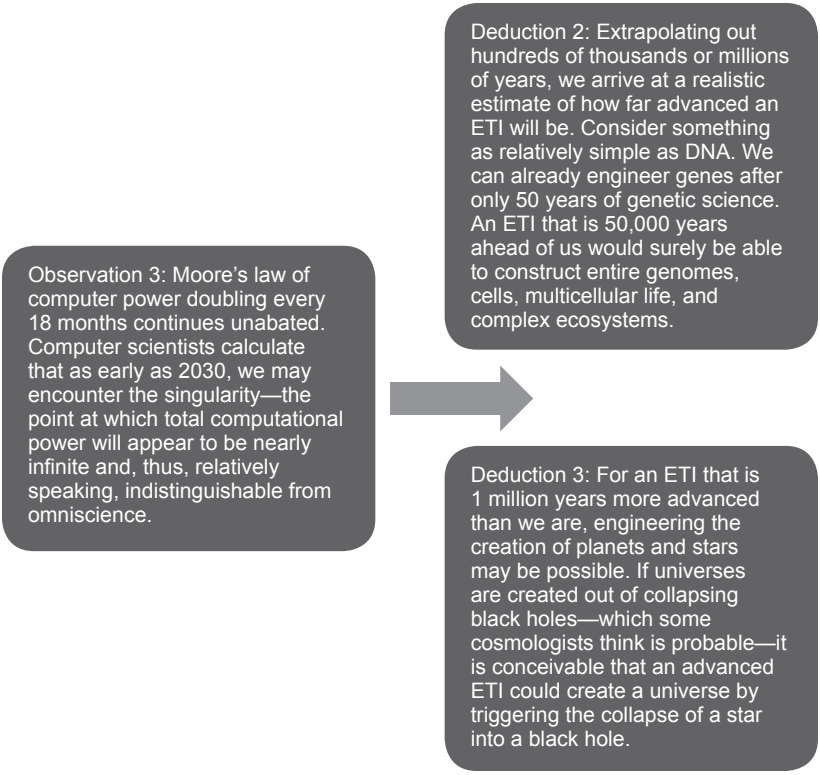
- Many believers think that scientists devise these theories to write God out of the equation, but that's not true. Whether they believe in God or not, when scientists are practicing science, they are duty-bound, so to speak, to look only for natural explanations for natural phenomena.

- The supernatural is not the domain of science; thus, what all these arguments and counterarguments show us is that no one has yet come up with proof of God's existence or nonexistence.

Shermer's Last Law and the Scientific Search for God

- Most theists believe that God created the universe and everything in it, including stars, planets, and life. But how could we distinguish an omnipotent and omniscient God or intelligent designer from an extremely powerful extraterrestrial intelligence (ETI)? This question leads us to Shermer's last law: Any sufficiently advanced ETI is indistinguishable from God. This law arises from an integration of evolutionary theory and the SETI program and can be derived from the observations and deductions shown in the following illustration.


Observation 1: Biological evolution is Darwinian and requires generations of differential reproductive success, whereas technological evolution is cultural and can be implemented within a single generation.
Observation 2: The cosmos is very big and space is very empty; thus, the probability of making contact with an ETI is remote.
Deduction 1: The probability of making contact with an ETI that is only slightly more advanced than us is virtually nil because the ETI, too, would have just recently discovered the physics behind radio transmissions and space flight. Any ETIs we encounter will either be far behind us or far ahead of us.


Deduction 2: Extrapolating out hundreds of thousands or millions of years, we arrive at a realistic estimate of how far advanced an ETI will be. Consider something as relatively simple as DNA. We can already engineer genes after only 50 years of genetic science. An ETI that is 50,000 years ahead of us would surely be able to construct entire genomes, cells, multicellular life, and complex ecosystems.
Observation 3: Moore's law of computer power doubling every 18 months continues unabated. Computer scientists calculate that as early as 2030, we may encounter the singularity—the point at which total computational power will appear to be nearly infinite and, thus, relatively speaking, indistinguishable from omniscience.
Deduction 3: For an ETI that is 1 million years more advanced than we are, engineering the creation of planets and stars may be possible. If universes are created out of collapsing black holes—which some cosmologists think is probable—it is conceivable that an advanced ETI could create a universe by triggering the collapse of a star into a black hole.

- What would we call an intelligent being capable of engineering life, planets, stars, and even universes? If we knew the underlying science and technology used to do the engineering, we would call it an extraterrestrial intelligence; if we did not know the underlying science and technology, we would call it God.

- Thus, we arrive at the conclusion: The only God that science could discover would be a natural being, an entity that exists in space and time and is constrained by the laws of nature. A supernatural God who exists outside of space and time is not knowable to science because he is not part of the natural world.

Theists, Atheists, and Agnostics

- Let's end this lecture by noting the problematic nature of the labels we use to describe people who believe in God (**theists**), do not believe in God (**atheists**), or think it is not possible to know one way or the other (**agnostics**).

- The word "agnosticism" was coined in 1869 by Thomas Henry Huxley, who wrote: "When I reached intellectual maturity and began to ask myself whether I was an atheist, a theist, or a pantheist… I found that the more I learned and reflected, the less ready was the answer. They [believers] were quite sure they had attained a certain 'gnosis,'…; while I was quite sure I had not, and had a pretty strong conviction that the problem was insoluble."

- Of course, no one is agnostic behaviorally. When we act in the world, we act as if there is a God or as if there is no God; by default, then, we must make a choice, if not intellectually, at least behaviorally.

- In other words, "agnosticism" is an intellectual position, a statement about the existence or nonexistence of the deity and our ability to know it with certainty, whereas "theism" and "atheism" are behavioral positions that describe what assumptions we make about the world in which we behave.

- For some of us, the label "skeptic" may be preferable to "atheist." When most people use the word "atheist," they are thinking of strong atheism, which asserts that God does not exist; that is not a tenable position (a negative cannot be proved). Weak atheism simply withholds belief in God for lack of evidence, which we all practice for nearly all the gods ever believed in history.

Important Terms

agnosticism: The belief that God is unknown or unknowable through reason or science.

anthropic principle: An argument often used as a scientific proof of God that the universe and the laws of nature are designed in such a way as to give rise to humans. There are three types of anthropic principles: (1) weak: the belief that the universe and the laws of nature must be configured as they are or else we wouldn't be here to observe them; (2) strong: the belief that the universe and the laws of nature must be configured as they are because there is no other way they could be structured; (3) final or participatory: the belief that the universe and the laws of nature must be configured as they are because humans are inevitable, and once we exist, we participate in the universe to preserve our existence.

atheism: Disbelief in, denial of, or lack of belief in the existence of God or a deity or deities.

first cause argument: A proof of God proposed by the Catholic theologian Saint Thomas Aquinas; argues that all effects in the universe have causes, including the universe itself, and therefore, there had to be a first cause, or God.

God: An all-powerful (omnipotent), all-knowing (omniscient), and all-good (omnibenevolent) being who created the universe and everything in it out of nothing; is uncreated and eternal; and is a noncorporeal spirit who created, loves, and can grant eternal life to humans.

Pascal's wager: The French mathematician and philosopher Blaise Pascal argued if we wager that God does not exist and he does, then we have everything to lose and nothing to win. If we wager that God does exist and he does, then we have everything to gain and nothing to lose.

prime mover argument: A proof of God proposed by the Catholic theologian Saint Thomas Aquinas; argues that because everything in the universe is in motion and nothing can be in motion unless it is moved by another, there must necessarily be a first mover, or God.

theism: Belief in God or a deity or deities.

Suggested Reading

Aquinas, *Summa Theologica*.

Craig, *On Guard*.

Davies, *The Mind of God*.

Dawkins, *The God Delusion*.

Harris, *The End of Faith*.

Hawking and Mlodinow, *The Grand Design*.

Lennox, *Gunning for God*.

Polkinghorne, *Science and Christian Belief.*

Smith, *Atheism*.

Stenger, *Has Science Found God?*

Ward, *God, Chance and Necessity.*

Questions to Consider

1. What do you think are the best arguments for God's existence?

2. What do you think are the best arguments for God's nonexistence?

3. Did this lecture change your mind one way or the other?

4. Do you think the God question is answerable by science, or is it a matter of faith?

Without God, Does Anything Go?

Lecture 16

In the last two lectures, we have seen how a skeptic views the topic of the existence of God, and we touched on one of the most common arguments raised by believers: If there is no God, then what is the origin and basis of morality? Where does our sense of right and wrong come from? Indeed, without God, is morality reduced to anything-goes relativism? In this lecture, we'll see how a skeptic thinks about the origins and foundation of morality and the moral sense. We'll also delve into the reality of moral principles: If these principles are real, then they can be discovered and studied by scientists in the same way as any natural phenomenon.

The Reality of Moral Principles

- The argument that moral principles are real and a natural part of the world dates back to Plato. In his dialogue *Euthyphro*, the Greek philosopher presented what has come to be known as **Euthyphro's dilemma**, in which Socrates asks a young man named Euthyphro the following question: "The point which I should first wish to understand is whether the pious or holy is beloved by the gods because it is holy, or holy because it is beloved of the gods?"

- Socrates is trying to show Euthyphro that there exists a dilemma over whether God embraces moral principles naturally occurring and external to him because they are sound ("holy") or whether these moral principles are sound because he created them. It cannot be both.

- We all know that adultery is wrong. Would it still be wrong even if it were not listed in the Ten Commandments? Of course.
    - By nature, humans are social and we pair bond. Anthropologists think that we pair bond because the rearing of children is so time and labor intensive that it takes two people.

- As well, evolutionary psychologists have worked out the science behind the moral emotion of jealousy, which evolved as a motivation of behavior called mate guarding.

- Because sometimes people do cheat on their partners, it would be costly for a man to invest his resources in rearing another man's child, and it would be damaging to a woman to have family resources that were allocated for raising her child be split with some other woman and her child by an unfaithful partner.

- The fact that we have a deep moral sense of right and wrong means that Euthyphro's dilemma is resolved: Moral principles exist, which means they are real and can be studied by scientists and analyzed from a skeptical perspective.

- This argument, known as natural law theory, was set forth by the 13th-century Catholic scholar Thomas Aquinas. He argued that God supports moral principles that occur naturally, instills them in us, and we then discover them through rational analysis, prayer, and our God-given mental faculty for moral reasoning. By the 18th century, a number of Enlightenment philosophers challenged the premise of Euthyphro's dilemma—most notably, the atheist Scottish philosopher David Hume—by taking God out of the moral equation altogether.

- Thomas Jefferson used natural law reasoning in one of the founding statements of the United States of America: "We hold these Truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness."
  - This concept that rights and morals exist separate from individual people and cultures and that God is not needed to objectify them is foreign to most people, which is why the American experiment has taken more than two centuries to catch on elsewhere in the world.

- Most people feel that without God, rights and morals are relative and, thus, meaningless. Without the transcendence offered by a God, believers argue, moral acts and principles can have no firm foundation on which to stand.

- But we can make the case that morality exists outside the human mind, in the sense of being not just a trait of individual people but a human trait or human universal. Moral sentiments and behaviors are hardwired into our brains just as much as other features of human cognition and emotion are because they are both evolutionarily adaptive and culturally reinforced.

The Evidence of Evolved Morality

- Our moral sentiments—the moral emotions contained within our mental armory—seem to have evolved out of pre-moral feelings of our hominid, primate, and mammalian ancestors, the remnants of which can be found in modern apes, monkeys, and other big-brained mammals. These sentiments are considered to be pre-moral because morality involves right and wrong thoughts and behaviors in the context of a social group. It does not appear that other animals can consciously assess the rightness or wrongness of thoughts or actions in themselves or fellow members of their species.

- Anyone who has had a dog as a pet recognizes that dogs quickly learn the difference between right and wrong, feel some sense of shame or guilt when scolded for bad behavior, and express joy and pride when being praised for good behavior. That sense of shame or pride is what we mean by "moral sentiments"; because dogs don't have symbolic language or, presumably, cognition, these are **pre-moral sentiments**.

- Evidence of pre-moral sentiments among wild animals abounds. Psychologist and primatologist Frans de Waal has documented hundreds of examples of pre-moral sentiments among apes and monkeys. Other scientists have recorded pre-moral sentiments in vampire bats, dolphins, whales, and elephants.

© iStockphoto/Thinkstock.

Dolphins have been seen to push sick or wounded members of a pod to the surface so that they may catch their breath, evidence of pre-moral sentiments.

- In fact, the following characteristics appear to be shared by humans and other mammals, especially apes, monkeys, dolphins, and whales: attachment and bonding, cooperation and mutual aid, sympathy and empathy, direct and indirect reciprocity, altruism and reciprocal altruism, conflict resolution and peace-making, deception and deception detection, community concern and caring about what others think, and awareness of and response to the social rules of the group.

- Species differ in the degree to which they express these sentiments, and with our exceptionally large brains, we clearly express most of them in greater degrees than other species. Nevertheless, the fact that such pre-moral sentiments exist in our nearest evolutionary cousins is a strong indication of their evolutionary origins.

Our Moral Psychology

- This moral sense or sentiment appears to be the basis of our moral psychology. For example, positive emotions, such as righteousness

and pride, are experienced as the psychological feeling of doing "good." These moral emotions likely evolved out of behaviors that were reinforced as being good either for the individual or for the group. Negative emotions, such as guilt and shame, are experienced as the psychological feeling of doing "bad." These moral emotions probably evolved out of behaviors that were reinforced as being bad either for the individual or for the group.

- This is the psychology of morality—the feeling of being moral or immoral. These moral emotions represent something deeper than specific feelings about specific behaviors. Although cultures may differ on what behaviors are defined as good or bad, the general moral emotion of feeling good or feeling bad about behavior *X* is an evolved emotion that is universal to all humans.

- Consider some of the more basic emotions that represent something deeper than specific feelings. When we need to eat, we do not compute caloric input/output ratios; we simply feel hungry. That feeling is an evolved hunger sentiment that triggers eating behavior. When we need to procreate to pass on our genes into the next generation, we do not calculate the genetic potential of a sexual partner; we feel aroused and seek out a partner we find attractive. The sexual urge is an evolved sexual sentiment that triggers sexual behavior.

- In an evolutionary theory of morality, asking, "If there is no God, why should we be moral?" is like asking, "Why should we be hungry?" or "Why should we want to have sex?" The answer is that it is as much a part of human nature to be moral as it is to be hungry or lustful.

- Specific behaviors in a culture may be considered right or wrong, and these vary over cultures and history. But the sense of being right or wrong in the emotions of righteousness and pride, guilt and shame is a human universal that appears to have had an evolutionary origin. The incest taboo—in place in all cultures around the world—serves as an example of the depth of our moral psychology; it is a strong moral emotion that evolved to maintain the genetic health of the species.

Our Moral Political Psychology

- Our moral psychology applies not just to our immediate loved ones and friends; it is also involved in group living with nonrelatives and strangers and even goes a long way toward explaining our political psychology. That is, politics is an extension of group living that ensures we get along relatively well with one another, and it turns out that our moral emotions are involved in politics, as well.

- Professor Jonathan Haidt, who studies moral political psychology, proposes that the foundations of our sense of right and wrong rest within "five innate and universally available psychological systems" that arose as a function of group living. He describes them as follows:
  - Harm/care: Related to our long evolution as mammals with attachment systems and an ability to feel (and dislike) the pain of others. This foundation underlies virtues of kindness, gentleness, and nurturance.

  - Fairness/reciprocity: Related to the evolutionary process of reciprocal altruism. This foundation generates ideas of justice, rights, and autonomy.

  - In-group loyalty: Related to our long history as tribal creatures able to form shifting coalitions. This foundation underlies virtues of patriotism and self-sacrifice for the group.

  - Authority/respect: Shaped by our long primate history of hierarchical social interactions. This foundation underlies virtues of leadership and followership, including deference to legitimate authority and respect for traditions.

  - Purity/sanctity: Shaped by the psychology of disgust and contamination. This foundation underlies religious notions of striving to live in an elevated, less carnal, nobler way. It underlies the widespread idea that the body is a temple that can be desecrated by immoral activities and contaminants.

- Over the years, Haidt and his colleague Jesse Graham have surveyed the moral opinions of more than 110,000 people from more than a dozen countries and regions around the world and have found this consistent difference: Liberals are high on harm/care and fairness/reciprocity but low on in-group loyalty, authority/respect, and purity/sanctity. Conservatives are roughly equal on all five dimensions, although they place slightly less emphasis on the first two and slightly more on the last three.

- Instead of viewing the left and the right as either right or wrong, a more reflective approach is to recognize that liberals and conservatives emphasize different moral values and tend to sort themselves into these two clusters.

- We appear to have evolved morals as part of our psychological equipment to help us lead better social lives with our fellow group members; thus, whether God exists or not doesn't matter because there really are absolute right and wrong moral principles that are encoded in our genes and culturally reinforced through our groups, societies, and even political parties.

Important Terms

Euthyphro's dilemma: A problem set forth in Plato's dialogue *Euthyphro*: Does God embrace moral principles naturally occurring and external to him because they are sound, or are these moral principles sound because he created them?

pre-moral sentiments: Feelings or emotions related to morality, such as shame or pride, evidenced by domesticated or wild animals.

Suggested Reading

Axelrod, *The Evolution of Cooperation*.

Boehm, *Hierarchy in the Forest*.

Dawkins, *The Selfish Gene*.

De Waal, *Good Natured*.

———, *Chimpanzee Politics*.

Edwards, "Socrates."

Haidt, *The Divided Mind*.

———, "The Emotional Dog and Its Rational Tail."

Moss, *Elephant Memories*.

Ridley, *The Origins of Virtue*.

Shermer, *The Science of Good and Evil*.

Trivers, "The Evolution of Reciprocal Altruism."

Wilkinson, "Reciprocal Food Sharing in the Vampire Bat."

Questions to Consider

1. If you found out today that there is no God, how would your morals change? Would you suddenly become immoral and dishonest? Would you lie, cheat, and steal? Or would you be moral because that is the right thing to do?

2. What is Euthyphro's dilemma, and how can it be resolved?

3. In what way do some animals, such as primates, marine mammals, and elephants, display pre-moral behaviors?

4. How does our moral psychology translate into a political psychology?

5. What are the five moral dimensions of political psychology, and how do liberals and conservatives differ on them? (Take the morality survey yourself at www.yourmorals.org.)

Life, Death, and the Afterlife

Lecture 17

Is there life after death? This is one of life's most compelling questions. All cultures throughout history and around the world have had some form of an afterlife built into their beliefs and religions, and most people believe that when we die, this is not the end of life. This lecture reviews four of the major forms of afterlife belief, along with the phenomenon of near-death experience, which provides the best scientific evidence available to us for the possibility of life surviving death. We'll learn why that evidence does not convince most scientists and what humanity's quest for immortality tells us about how the mind works.

Can We Imagine Death?

- What picture comes to mind when you attempt to imagine your own death: your funeral with a casket surrounded by family and friends or perhaps complete darkness and void? Whatever it is you imagine, you are still conscious and observing the scene. But in reality, you can no more envision what it is like to be dead than you can visualize yourself before you were born.

- In his book *Immortality: The Quest to Live Forever and How It Drives Civilization*, the British philosopher Stephen Cave calls this the mortality paradox: "Death presents itself as both inevitable and impossible," he suggests. We see it all around us, yet "it involves the end of consciousness, and we cannot consciously simulate what it is like to not be conscious."

- The attempt to resolve the paradox has led to four major immortality narratives, as outlined by Cave:
    - Staying-alive narrative: "like all living systems, we strive to avoid death. The dream of doing so forever—physically, in this world—is the most basic of immortality narratives."

- Resurrection narrative: "the belief that, although we must physically die, nonetheless we can physically rise again with the bodies we knew in life."

- Legacy narrative: "more indirect ways of extending ourselves into the future," such as glory, reputation, historical impact, or children.

- Soul narrative: the "dream of surviving as some kind of spiritual entity."

- Cave concluded: "Unfortunately, none of these narratives seems capable of delivering us everlasting life."

Near-Death Experience

- **Near-death experiences** provide us with the best scientific evidence available for the possibility of life surviving death, and we now know a great deal about them.
  - For example, researchers working for the U.S. military have discovered that pilots exposed to G-force acceleration can

© iStockphoto/Thinkstock.

Military pilots may lose consciousness and undergo the sensations associated with near-death experiences when exposed to G-force acceleration.

lose consciousness during aerial combat maneuvering and experience many of the sensations associated with near-death experiences: a floating or flying feeling, commonly called an **out-of-body experience (OBE)**; the sensation of passing through a tunnel or hallway, sometimes with a bright light at the end of it; and the sight of loved ones who have already passed away or a godlike image or divine figure.

- These researchers have been able to induce OBEs and the tunnel sensation in subjects more than 1,000 times in 16 years of study, leaving no doubt as to the cause: **apoxia**, or oxygen deprivation to the cortex.

- In a 2002 study published in *Nature*, the Swiss neuroscientist Olaf Blanke and his colleagues reported that they could produce OBEs through electrical stimulation of the right angular gyrus in the temporal lobe of a 43-year-old woman suffering from severe epileptic seizures.
  - Blanke's team concluded: "These observations indicate that OBEs and complex somatosensory illusions can be artificially induced by electrical stimulation of the cortex. The association of these phenomena and their anatomical selectivity suggest that they have a common origin in body-related processing, an idea that is supported by the restriction of these visual experiences to the patient's own body."

  - As we said in an earlier lecture, the primary function of the brain is to run the body; thus, a displaced body schema may help explain not only the sensed-presence effect but also OBEs.

- In a related study reported in the book *Why God Won't Go Away*, neuroscientist Andrew Newberg and his colleague Eugene D'Aquili found that when Buddhist monks meditate and Franciscan nuns pray, brain scans made during these activities indicate strikingly low activity in the posterior superior parietal lobe, a region of the brain the authors have dubbed the orientation association area (OAA).

- The OAA's job is to orient the body in physical space, and people with damage to this area have a difficult time negotiating their way through a space, sometimes even bumping into objects. Even though an individual can see an obtrusive object, the brain does not process it as something separate from the body.

- When the OAA is booted up and running smoothly, there is a sharp distinction between self and non-self. But when the OAA is in sleep mode—as in deep meditation and prayer—that division breaks down, leading to a blurring of the lines between reality and fantasy, between feeling in body and out of body. Perhaps this is what happens to monks who experience a sense of oneness with the universe or with nuns who feel the presence of God.

- This hypothesis was further supported in a 2010 discovery that damage to the posterior superior parietal lobe through tumorous legions can cause patients to suddenly experience feelings of spiritual transcendence.

Lack of Near-Death Experience

- If the near-death experience is universal and a sign that something survives the body after death, why is it that only about 10 to 15 percent of people who come close to death have such experiences? What does the lack of near-death experience mean?

- Dr. Mark Crislip, an emergency room doctor in Portland, Oregon, reviewed the original EEG readings of a number of patients claimed by scientists as being flat-lined or "dead" and discovered that this was not at all the case: "What they showed was slowing, attenuation, and other changes, but only a minority of patients had a flat line…. The curious thing was that even a little blood flow in some patients was enough to keep EEG's normal."
  - Having your heart stop for 2 to 10 minutes and being promptly resuscitated doesn't make you "clinically dead"; it means only that your heart isn't beating and you may not be conscious.

Under these circumstances, near-death experiences seem eminently possible and, in fact, not even that surprising.

- Again, given that our normal experience is of stimuli coming into the brain from the outside, when a part of the brain abnormally generates hallucinations, another part of the brain—quite possibly the left-hemisphere interpreter described by neuroscientist Michael Gazzaniga—interprets them as external events. Hence, the abnormal is interpreted as supernormal.

- A final piece of evidence comes from research by neuroscientists who have now documented that in the brains of people undergoing hallucinations, the same sensory perceptual systems become active as those engaged in the sensation of actual physical stimulation. As the great neurologist Dr. Oliver Sacks notes in his many remarkable books, all such experiences reside in the brain, not in the world.

Monism versus Dualism Revisited

- In an earlier lecture, we discussed dualism—the belief that there are two substances in the universe (material and immaterial, body and soul, brain and mind)—and monism—the belief that there is just one substance in the universe (material, body, brain). Most religions are dualistic, believing that the **soul** is a conscious ethereal substance, the unique essence of a living being that survives its incarnation in flesh.

- A religious definition of "soul" might read: the essence that breathes life into flesh, animates us, and gives us our vital spirit. In contrast, a skeptical or scientific definition might read: The soul is the unique pattern of information that represents a person.
  - Our bodies are made of proteins, coded by DNA that directs the pattern of information that makes up all the parts of the body; with the disintegration of DNA, our protein patterns are lost forever.

  - Our memories and personalities are stored in the patterns of neurons firing in our brains and the synaptic connections

between them; when those neurons die and those synaptic connections are broken, it spells the death of our memories and personalities.

- Until a technology is developed to download our patterns into a more durable medium than the electric meat of our carbon-based protein, the scientific evidence tells us that when we die, our pattern of information—our soul—dies with us.

- Nevertheless, polls show that the vast majority of people believe in an afterlife. We can describe at least six explanations for this belief:
  - Belief in the afterlife is a form of agenticity. In our tendency to infuse the patterns we find in life with meaning, agency, and intention, the concept of life after death is an extension of ourselves as intentional agents continuing indefinitely into the future.

  - Belief in the afterlife is a type of dualism. Because we are natural-born dualists who intuitively believe that our minds are separate from our brains and bodies, the afterlife is the logical step in projecting our own mind-agency into the future without our bodies.

  - Belief in the afterlife is an extension of the body schema. Our brains construct a body image out of input from every nook and cranny of our bodies; when woven together, this image forms a seamless tapestry of a single individual called the self. When coupled to our capacity for agenticity and dualism, we can project that essence into the future, even without a body.

  - Belief in the afterlife is mediated by our left-hemisphere interpreter, which integrates input from all the senses into a meaningful narrative arc that makes sense of both senseful and senseless data.

- Belief in the afterlife is an extension of our normal ability to imagine ourselves somewhere else both in space and time, including time immemorial.

- Belief in the afterlife appears to preserve the hope of some purpose and sense to what otherwise appears to be a pointless existence.

Hoping and Knowing

- Our belief systems are structured such that we will almost always find a way to support what we want to believe. Thus, the overwhelming desire to believe in something otherworldly means that we should be especially vigilant in our skepticism of claims made in this arena.

- Is scientific monism in conflict with religious dualism? Yes, it is. Either the soul survives death or it does not, and there is no scientific evidence that it does.

- Do science and skepticism extirpate all meaning in life? No, they seem to do quite the opposite. If our present lives are all we have, then our families, our friends, our communities, how we conduct ourselves, indeed, every moment of every day counts—not as props in a temporary staging before an eternal tomorrow but as valued essences in the here and now.

Important Terms

apoxia: Oxygen deprivation to the cortex that often results in out-of-body and near-death experiences.

near-death experience: Characterized by one of three commonly reported elements: (1) a floating sensation in which the subject looks down and sees his or her own body; (2) the feeling of passing through a tunnel or spiral chamber toward a bright light that represents transcendence to "the other side"; (3) emergence on the other side and the sight of loved ones who have already passed away or a godlike figure.

out-of-body experience (OBE): The sensation of floating out of one's body, usually upward such that the view of the body is from above with the body below.

soul: A religious definition of this term might read as follows: a conscious ethereal substance that is the unique essence of a living being that survives its incarnation in flesh. A scientific definition might read: the unique pattern of information that represents a person, stored in our DNA and neural networks.

Suggested Reading

Augustine, "Near-Death Experiences with Hallucinatory Features."

Beyerstein, "Altered States of Consciousness."

Blackmore, *Dying to Live*.

Blanke et al., "Neuropsychology: Stimulating Illusory Own-Body Perceptions."

Brugger and Mohr, "Out of the Body, But Not Out of the Mind."

Tipler, *The Physics of Immortality*.

Whinnery, "Psychophysiologic Correlates of Unconsciousness and Near-Death Experiences."

Questions to Consider

1. What is the soul?

2. What is dualism, and how does it differ from monism?

3. What is the likeliest explanation for out-of-body and near-death experiences?

Your Skeptical Toolkit

Lecture 18

In this course, we have covered a broad range of topics related to science and pseudoscience and learned many new skills for thinking like scientists in our personal and professional lives. For each particular claim, we have reviewed how scientists think about it and where our own thinking often goes wrong. This final lecture outlines some general principles that we can apply to what the great astronomer and skeptic Carl Sagan called "the fine art of baloney detection." The ideas, principles, and aphorisms in this lecture constitute what we'll call a skeptics' toolkit.

Harry Houdini, Arthur Conan Doyle, and Carl Sagan

- The story of the magician Harry Houdini and the writer Sir Arthur Conan Doyle reminds us that anyone—no matter how smart, educated, or capable of logical reasoning—can be fooled. It also reminds us of two principles we learned earlier in the course: (1) Before you say that something is out of this world, first make sure that it is not in this world, and (2) the fact that something is unexplained doesn't mean that it's paranormal, supernatural, extraterrestrial, or conspiratorial.

- We need a practical way of determining what is and is not true, and the first items we can put in our toolkit for this purpose are reminders from Carl Sagan, highlighted in his book *The Demon-Haunted World*.
    - Encourage substantive debate on the evidence by knowledgeable proponents of all points of view.

    - Arguments from authority carry little weight. "Authorities" have made mistakes in the past and will do so again in the future. Perhaps a better way to state this principle is that in science, there are no authorities; at most, there are experts.

- Spin more than one hypothesis. If there's something to be explained, think of all the different ways in which it could be explained. Then think of tests by which you might systematically disprove each of the alternatives. What survives—the hypothesis that resists disproof in this Darwinian selection among multiple hypotheses—has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.

- Try not to get overly attached to a hypothesis just because it's yours. A hypothesis is only a way station in the pursuit of knowledge. Ask yourself why you like the idea. Compare it fairly with the alternatives. See if you can find reasons for rejecting it. If you don't, others will.

- Reliance on carefully designed and controlled experiments is key. We will not learn much from mere contemplation. It is tempting to be content with the first candidate explanation we can think of, but what happens if we come up with several? How do we decide among them? We rely on experiment.

• Another set of tools in our skeptics' toolkit was also inspired by Carl Sagan's work. It consists of a series of questions to ask when encountering any claim:
  - Does the source of a questionable claim often make other, similarly questionable claims? Pseudoscientists have a habit of going well beyond the facts; thus, when individuals make numerous extraordinary claims, they may be more than just iconoclasts. They may simply be cranks who are always wrong.

  - Have the claims been verified by another source? Typically, pseudoscientists make statements that are unverified or verified by a source within their own belief circle. We must ask: Who is checking the claims, and who is checking the checkers?

  - Has anyone gone out of the way to disprove the claim, or has only confirmatory evidence been sought? The goal here is to

counter the confirmation bias that we've discussed throughout this course—the tendency to seek confirming evidence and reject or ignore disconfirming evidence. The danger of this bias is the reason that verification and replication are critical in science.

- Has the claimant provided an alternative to the accepted explanation for the observed phenomena or merely denied the existing explanation? This question speaks to a classic debate strategy: Criticize your opponent, and to avoid criticism, never affirm what you believe. But this stratagem is unacceptable in science. Big bang skeptics, for example, ignore the convergence of evidence of this cosmological model, focus on the few flaws in the accepted model, and have yet to offer a viable cosmological alternative that carriers a preponderance of evidence in favor of it.

- Do the claimants' personal beliefs and biases drive the conclusions or vice versa? All scientists hold social, political, and ideological beliefs that could potentially slant their interpretations of the data, but how do those biases and beliefs affect their research? At some point, usually during the peer-review system, such biases and beliefs are rooted out.

Logic-Tight Compartments

- Even with all these precautions in place, any of us may end up believing weird things, even while being rational and scientific in other areas of our lives. The reason for this has to do with what we might call **logic-tight compartments**—modules in the brain analogous to watertight compartments in a ship.

- The existence of compartmentalized brain functions, acting in either concert or conflict, has been a core idea of evolutionary psychology since the 1990s. According to University of Pennsylvania evolutionary psychologist Robert Kurzban, the brain evolved as a modular, multitasking, problem-solving organ—a Swiss army knife of practical tools. There is no unified "self" that generates

internally consistent and seamlessly coherent beliefs. Instead, we are a collection of distinct but interacting modules that are often at odds with one another.

- Compartmentalization is also at work when new scientific theories conflict with older and more naïve beliefs. In a 2012 paper in the journal *Cognition*, Occidental College psychologists Andrew Shtulman and Joshua Valcarcel found that subjects more quickly verified the validity of scientific statements when those statements agreed with their prior naïve beliefs. Contradictory scientific statements were processed more slowly and less accurately, suggesting that "naïve theories survive the acquisition of a mutually incompatible scientific theory, coexisting with that theory for many years to follow."

Skeptical Mottos

- Also in the skeptics' toolkit is an aphorism often attributed to Carl Sagan but actually said by others before him: Extraordinary claims require extraordinary evidence.

- A related observation comes from the journalist Christopher Hitchens, who wrote, "What can be asserted without evidence can also be dismissed without evidence." This is a variation on David Hume's "A wise man proportions his belief to the evidence."

- As we've learned, another valuable motto for skeptics is simply: "I don't know." We don't have to have an explanation for everything.

Wronger Than Wrong

- Still another arrow in our skeptical quiver comes from the great science writer Isaac Asimov in a poignant essay called "The Relativity of Wrong": "When people thought the Earth was flat, they were wrong. When people thought the Earth was spherical, they were wrong. But if you think that thinking the Earth is spherical is just as wrong as thinking the Earth is flat, then your view is wronger than both of them put together."

- The Oxford evolutionary biologist Richard Dawkins put this another way in a 1996 *New Yorker* article: "When two opposite points of view are expressed with equal intensity, the truth does not necessarily lie exactly halfway between them. It is possible for one side to be simply wrong."

- As we saw in the lecture on evolution and creationism, evidence strongly indicates that one side (creationism) is simply wrong, no matter how much we would all like to get along and find compromise.

Science and Democracy

- Democracy is a form of science in the sense that democratic elections are like scientific experiments: Every couple of years, we carefully alter the variables with an election and observe the results. If we want different results, we change the variables with another election.

- This idea is well argued by the science writer Timothy Ferris in his 2010 book *The Science of Liberty*. Ferris argues that the scientific values of reason, empiricism, and anti-authoritarianism are not the products of liberal democracy but the producers of it: "The founders often spoke of the new nation as an 'experiment.' Procedurally, it involved deliberations about how to facilitate both liberty and order, matters about which the individual states experimented considerably during the eleven years between the Declaration of Independence and the Constitution."

- In fact, many of the founding fathers of the United States were scientists who deliberately adapted the method of data gathering, hypothesis testing, and theory formation to their nation building. Their understanding of the provisional nature of findings led them naturally to form a social system wherein doubt and disputation were the centerpieces of a functional polity.

- Ferris sees political claims, such as the idea of equality under the law, as "methods, not ideologies." He goes on to explain: "Both [liberalism and science] incorporate feedback loops through which actions (e.g., laws) can be evaluated to see whether they continue

© iStockphoto/Thinkstock.

Einstein observed, "One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike—and yet it is the most precious thing we have."

to meet with general approval. Neither science nor liberalism makes any doctrinaire claims beyond the efficacy of its respective methods—that is, that science obtains knowledge and that liberalism produces social orders generally acceptable to free peoples."

- The myth of the scientific method as a series of neat and tidy steps from hypothesis and prediction to experiment and conclusion is busted once you go into a lab and observe the more haphazard and messy realities of researchers feeling their way toward discovery. The same is true of liberal democracies, which almost never work out as planned but somehow progress ever closer to finding the right balance between individual liberty and social order.

Science and Spirituality

- There are many ways to be spiritual, and science, in its awe-inspiring account of who we are and where we came from, is among them.

- Science tells us that we are but one among hundreds of millions of species that evolved over the course of 3.5 billion years on one tiny planet among many planets orbiting an ordinary star, itself one of possibly billions of solar systems in an ordinary galaxy that contains hundreds of billions of stars, itself located in a cluster of galaxies not so different from millions of other galaxy clusters, themselves whirling away from one another in an accelerating, expanding cosmic-bubble universe that very possibly is only one among a near infinite number of bubble universes.

- If spirituality means a sense of awe and wonder and humility in the face of the creation, what could be more awesome and wonderous and humbling than the deep space discovered by astronomers and cosmologists and the deep time discovered by biologists and geologists? Science matters because it is the preeminent story of our age, an epic saga about who we are, where we came from, and where we are going.

Important Term

logic-tight compartments: Modules in the brain analogous to watertight compartments in a ship that allow us to hold conflicting beliefs simultaneously.

Suggested Reading

Cialdini, *Influence*.

Damasio, *Descartes' Error*.

Gardner, *Fads and Fallacies in the Name of Science*.

Gilovich, *How We Know What Isn't So*.

Gordin, *The Pseudoscience Wars*.

Kevles, *The Baltimore Case.*

Kahneman, *Thinking Fast and Slow*.

Kurtz, *The Transcendental Temptation*.

Paul and Paul, *Critical Thinking*.

Pigliucci, *Nonsense on Stilts*.

Sagan, *The Demon-Haunted World*.

Shermer, *The Borderlands of Science*.

Tavris and Aronson, *Mistakes Were Made (But Not by Me)*.

Questions to Consider

1. What is in the skeptics' toolkit, and how can it be used to help us detect baloney when we encounter it?

2. In what ways do you find a sense of spirituality in science?

Glossary

action potential: When the cell wall of a neuron becomes permeable to sodium, with a corresponding shift in voltage from negative to positive, an electrical signal travels down the axon to the dendrites at the end of the neuronal cell, where the signal may then be passed on to other neurons; colloquially, the cell "fired."

ad hominem: Literally, "to the man"; this fallacy of thinking places the focus of inquiry on the person making the claim instead of on the claim itself. An "*ad hominem* attack" is an attack on the person instead of the argument.

ad ignorantiam: An appeal to ignorance or the belief that if someone cannot disprove a claim, then it must be true.

agenticity: The tendency to infuse patterns with meaning, intention, and agency.

agnosticism: The belief that God is unknown or unknowable through reason or science.

alternative history: Claims about the past that are usually at odds with what mainstream professional historians have come to conclude about the past.

anchoring effect: The tendency to rely too heavily on a past reference or on one piece of information when making decisions.

anthropic principle: An argument often used as a scientific proof of God that the universe and the laws of nature are designed in such a way as to give rise to humans. There are three types of anthropic principles: (1) weak: the belief that the universe and the laws of nature must be configured as they are or else we wouldn't be here to observe them; (2) strong: the belief that the universe and the laws of nature must be configured as they are because there is no other way they could be structured; (3) final or participatory: the belief that the universe and the laws of nature must be configured as they

are because humans are inevitable, and once we exist, we participate in the universe to preserve our existence.

apoxia: Oxygen deprivation to the cortex that often results in out-of-body and near-death experiences.

assortative mating: The idea that like marries like. People are attracted to other people who are similar to them in looks and beliefs, and this leads to offspring who are similar to their parents in both genetics and upbringing.

atheism: Disbelief in, denial of, or lack of belief in the existence of God or a deity or deities.

attentional blindness: The tendency to miss something obvious and general while attending to something special and specific.

attribution bias: The tendency to attribute different causes for our own beliefs and actions than those of others; also known as the fundamental attribution error. There are several variants: A situational attribution bias happens when we identify the cause of someone's belief or behavior in the environment; a dispositional attribution bias is when we identify the cause of someone's belief or behavior in the person as an enduring personal trait; an intellectual attribution bias is when people consider their own beliefs as being rationally motivated; and an emotional attribution bias is when people see the beliefs of others as being emotionally driven.

availability bias: The tendency to assign probabilities of potential outcomes based on examples that are immediately available to us, especially those that are vivid, unusual, or emotionally charged.

behavior genetics: The study of the relative roles of nature and nurture, genetics and environment, biology and culture, primarily through the use of twin studies, most notably, twins who were separated from birth and raised in separate environments.

blind-spot bias: The tendency to recognize the power of cognitive biases in other people but to be blind to their influence on our own beliefs.

body schema: The brain's mapping of the body, from toes and fingers through legs and arms, into the torso, and up the back to the top of the head. It may also extend beyond the body into the world when engaged with other people through language—when writing something down on paper or typing it into a computer—or when engaged in any other extended reach from inside the head to outside the body.

burden of proof: The principle in skeptical thinking that the burden of proof is on the person making the claim and not on the recipients of the claim.

channeling: A form of ESP or paranormal activity in which a long-dead person speaks through a living "channeler."

circular reasoning: Also known as the fallacy of redundancy or a tautology, this is the process of attempting to prove a claim or bolster a belief by simply restating it in other words.

cognitive dissonance: The uncomfortable tension that comes from holding two conflicting thoughts at the same time.

cognitive heuristics: Thinking shortcuts to help us make snap decisions under uncertainty; also known as cognitive shortcuts or cognitive rules of thumb.

cold reading: A type of mentalism in which someone "reads" someone else "cold," having never met the subject. It is a trick used by psychics and others to make it seem as if they have ESP.

comparative method: A historical method of hypothesis testing wherein the historian examines natural experiments that took place in history with an eye toward finding similarities and differences to explore similar or different outcomes.

compliance: The outward apparent conformity by individuals to group norms or an authority's commands.

confirmation bias: The tendency to search for and find confirming evidence for what we already believe and to ignore or rationalize away disconfirming evidence.

conformity: The internalization of a group's beliefs to the point where they become one's own.

conspiracy: When two or more people meet or confer in secret to act against a third party.

conspiracy theory: The belief in a conspiracy that may or may not be true. The events of 9/11 were the result of a conspiracy; by definition, 19 members of al-Qaeda plotting to fly planes into buildings without warning us ahead of time constitutes a conspiracy. The theory that the U.S. government orchestrated 9/11 is a conspiracy theory.

construct: A nontestable statement to account for a set of observations.

convergence-of-evidence method: Sometimes called the "consilience of inductions," this is the process of examining converging evidence from multiple lines of inquiry to determine whether it leads to a single conclusion.

Copernican principle: A principle based on the discovery of the 16th-century Polish astronomer Nicholas Copernicus that the Earth is not the center of the solar system. The principle holds that our planet has no special status in the cosmos, that we are not special, and that if the laws of nature operate elsewhere in the cosmos as they do here, then planets such as Earth and life such as ours should be typical and common.

cult: A religious group with novel religious beliefs and a high degree of tension with the surrounding society.

curse of knowledge: A cognitive bias in which better-informed people find it difficult to think about problems from the perspective of lesser-informed people. Once we know something, we can't un-know it, and knowing it influences how we interpret it.

deduction: A specific prediction based on a hypothesis.

dehumanization: The process of removing the humanity of people by treating them as "others"—so different from everyone we know that they must be effectively strangers, perhaps not even human.

deindividuation: The process of removing people's individuality by taking them out of their normal social circle of family and friends, dressing them in identical uniforms, or insisting that they be team players or go along with the program.

diffusion of responsibility: The collective beliefs among members of a group that someone else is taking responsibility for a particular problem or issue, to the point where no one acts.

dogmatism: Basing conclusions on authority rather than logic and evidence.

domain-general intelligence: An individual's ability to acquire and use knowledge to analyze various situations and conditions, find solutions to problems, and so on.

domain-specific intelligence: An individual's knowledge in a specific field, such as psychology, history, and so on.

Drake equation: Equation proposed in 1961 by the radio astronomer Frank Drake for estimating the number of technological civilizations that reside in our galaxy: $N = R\, f_p\, n_e\, f_l\, f_i\, f_c\, L$. The variables are as follows: N = the number of communicative civilizations, R = the rate of formation of suitable stars, f_p = the fraction of those stars with planets, n_e = the number of Earth-like planets per solar system, f_l = the fraction of planets with life, f_i = the fraction of planets with intelligent life, f_c = the fraction of planets with communicating technology, L = the lifetime of communicating civilizations.

dualism: The belief in two substances in the world—corporeal and incorporeal, body and soul, brain and mind; in contrast with monism.

either-or fallacy: Sometimes called the fallacy of negation or the false dilemma, this is the attempt to set up a false choice between one claim and another, such that if you can disprove the first claim, the second one must be true. But this is not so; they could both be wrong. Positive evidence is needed in favor of a belief, not just negative evidence against another person's belief.

endowment effect: The tendency to value what we own more than what we do not own.

ESP: Extrasensory perception, or the claim that information may be transferred through nonsensory or extrasensory means beyond the present understanding of the science of sense perception.

essentialism: The belief that objects, animals, and people contain an essence—an invisible force or substance that is at the core of their being that makes them what they are—and that this essence may be transmitted from objects to people and from people to people.

Euthyphro's dilemma: A problem set forth in Plato's dialogue *Euthyphro*: Does God embrace moral principles naturally occurring and external to him because they are sound, or are these moral principles sound because he created them?

fact: A conclusion confirmed to such an extent that it would be reasonable to offer provisional assent.

Fermi's paradox: Named after the Italian physicist Enrico Fermi, who first proposed the problem: Assuming the Copernican principle that we are not special, abundant extraterrestrial intelligences (ETIs) should exist; if so, then at least some of these ETIs would have figured out self-replicating robotic spacecraft and/or practical interstellar space travel themselves. Assuming that at least some of those ETIs would be millions of years ahead of us on an evolutionary time scale, their technologies would be advanced enough to have found us by now, but they haven't, so… where are they?

first cause argument: A proof of God proposed by the Catholic theologian Saint Thomas Aquinas; argues that all effects in the universe have causes, including the universe itself, and therefore, there had to be a first cause, or God.

folk numeracy: Our natural tendency to misperceive probabilities, to think anecdotally instead of statistically, and to focus on and remember short-term trends and small-number runs.

framing effect: The tendency to draw different conclusions based on how data are presented or framed by choice alternatives.

G-force–induced loss of consciousness (G-LOC): Experienced by pilots subjected to G-force acceleration; they lose consciousness and often experience "dreamlets," or brief episodes of tunnel vision, sometimes with a bright light at the end of the tunnel; a sensation of floating; and out-of-body experiences.

global coherence: The psychological propensity to believe that everything happens for a reason, there are no accidents, and that there is an overriding force or operation at work—either natural or supernatural—that ties together apparently discoherent events into one grand or global theory. In conspiracy theorizing, this often manifests as the New World Order.

God: An all-powerful (omnipotent), all-knowing (omniscient), and all-good (omnibenevolent) being who created the universe and everything in it out of nothing; is uncreated and eternal; and is a noncorporeal spirit who created, loves, and can grant eternal life to humans.

high road of controlled reason: Controlled processes in the brain that tend to use linear, step-by-step logic and are deliberately employed; we are aware of these processes when we use them. Such controlled processes tend to occur in the front (orbital and prefrontal) parts of the brain. The prefrontal cortex is known as the executive region because it integrates the other regions for long-term planning.

hindsight bias: The tendency to reconstruct the past to fit with present knowledge; also known as Monday-morning quarterbacking.

Hume's maxim: Observations by the 18th-century Scottish philosopher David Hume, considered one of the greatest skeptical thinkers in history, on the nature of belief, evidence, and miraculous claims: "A wise man proportions his belief to the evidence," and: "No testimony is sufficient to establish a miracle, unless the testimony be of such a kind that its falsehood would be more miraculous than the fact which it endeavors to establish."

hypnagogic hallucination: Delusional mental states that occur just after falling asleep, as the conscious brain slips into unconsciousness. In this fuzzy borderland between wakefulness and sleep, people report seeing and hearing things that are not actually present, such as speckles, lines, geometrical patterns, representational images, and voices and sounds.

hypnopompic hallucination: Delusional mental states that occur just before waking up, as the conscious brain emerges from the unconsciousness of sleep. In this fuzzy borderland between sleep and wakefulness, people report seeing and hearing things that are not actually present, such as speckles, lines, geometrical patterns, representational images, and voices and sounds.

hypnotic regression: A technique in which a subject is hypnotized and asked to imagine regressing back in time to retrieve a memory from the past and then play it back on the imaginary screen of the mind. The technique is unreliable as a method of memory retrieval.

hypothesis: A testable statement accounting for a set of observations.

identification: The close affiliation with others of like interest, as well as the normal process of acquiring social roles through modeling and role playing.

induction: The formation of a hypothesis by drawing general conclusions from existing data.

intelligent design, intelligent design creationism: The belief that the order, purpose, and design found in the world is proof of an intelligent designer and that the description of the creation in the Bible roughly matches that of modern science, although evolution is limited in what it can create.

locus of control: The extent to which an individual believes that he or she is in control of the environment (internal locus of control) or that the environment controls the individual (external locus of control).

logic-tight compartments: Modules in the brain analogous to watertight compartments in a ship that allow us to hold conflicting beliefs simultaneously.

loss aversion: Losses hurt twice as much as gains feel good; thus, we are averse to loss and avoid it where possible.

low road of automatic emotion: Automatic processes in the brain that tend to operate unconsciously, nondeliberately, and in parallel; we are unaware of these processes when we use them. Automatic processes tend to occur in the back (occipital), top (parietal), and side (temporal) parts of the brain. The amygdala is associated with automatic emotional responses, especially fear.

lucid dream: A dream in which the sleeping person is aware that he or she is asleep and dreaming but can participate in and alter the dream itself.

Manchurian candidate: Based on the film of the same name, this is a brainwashed human capable of being completely controlled by another to the point of being commanded to commit murder or mayhem.

methodological naturalism: The principle of science that holds that life is the result of natural processes in a system of material causes and effects that does not allow or need the introduction of supernatural forces. This fundamental concept is rejected by advocates of intelligent design.

microseizures: Small seizures in the temporal lobes of brains that may produce what can best be described as "spiritual" or "supernatural" experiences: the sense of a presence in the room, an out-of-body experience, bizarre distortion of body parts, and even profound religious feelings of being in contact with God, gods, saints, and angels.

mind schema: Similar to our body schema, the mind schema is our psychological sense of self, coordinating the various independent neural networks that at any given moment are working away at various problems

in daily living into a coherent whole perceived as a "self." There is some evidence that this happens in the left hemisphere of the brain.

miracle: An event with million-to-one odds of occurring.

monism: The belief in one substance in the world—corporeal (no incorporeal), body (no soul), brain (no mind); in contrast with dualism.

monological belief system: A unitary, closed-off worldview in which beliefs come together in a mutually supportive network.

mysticism: Basing conclusions on personal insights that exclude external validation.

near-death experience: Characterized by one of three commonly reported elements: (1) a floating sensation in which the subject looks down and sees his or her own body; (2) the feeling of passing through a tunnel or spiral chamber toward a bright light that represents transcendence to "the other side"; (3) emergence on the other side and the sight of loved ones who have already passed away or a godlike figure.

null hypothesis: The assumption or default position that the hypothesis under investigation is not true (null) until proven otherwise.

obedience to authority: The blind following of a leader or authority figure that leads people to commit acts they would not otherwise engage in.

objectivity: Basing conclusions on external validation.

observation: Gathering data, driven by hypotheses that tell us what to look for in nature.

out-of-body experience (OBE): The sensation of floating out of one's body, usually upward such that the view of the body is from above with the body below.

Pascal's wager: The French mathematician and philosopher Blaise Pascal argued if we wager that God does not exist and he does, then we have everything to lose and nothing to win. If we wager that God does exist and he does, then we have everything to gain and nothing to lose.

patternicity: The tendency to find meaningful patterns in both meaningful and meaningless noise.

post hoc, ergo propter hoc: Literally, "after this, therefore because of this"; also known as after-the-fact reasoning. This thinking is, at its basest form, superstition or magical thinking, connecting *A* to *B* when there is no connection. In statistical analysis, it comes in the form of "correlation does not mean causation."

pre-moral sentiments: Feelings or emotions related to morality, such as shame or pride, evidenced by domesticated or wild animals.

prime mover argument: A proof of God proposed by the Catholic theologian Saint Thomas Aquinas; argues that because everything in the universe is in motion and nothing can be in motion unless it is moved by another, there must necessarily be a first mover, or God.

principle of positive evidence: This principle states that a claimant must have positive evidence in favor of a theory, not just negative evidence against rival theories.

pseudohistory: A type of pseudoscience in which practitioners appear to use the rigorous methods of scientific history but, in fact, selectively choose to present only limited evidence in support of a particular belief about the past.

qualia: The subjective experience of the world through thoughts and feelings that arise from a concatenation of neural events.

rationalism: Basing conclusions on logic and evidence.

reductio ad absurdum: The attempted refutation of an argument by carrying it to its apparently logical and often absurd conclusion. A recent subset of

this fallacy has come to be known as *reductio ad Hitlerum*, in which one equates someone else's belief or claim with Hitler and/or the Nazis, thereby gainsaying it by association with evil.

reduplicative paramnesia: A brain disorder in which people believe that there are copies of people or places that they mix up into one experience or story that makes perfect sense to them even if it sounds ridiculous to everyone around them.

religion: A social institution to create and promote myths, to encourage conformity and altruism, and to signal the level of commitment to cooperate and reciprocate among members of a community.

representative bias: The tendency to judge the probability of an event based on the essential features of its parent type.

science: A set of methods designed to describe and interpret observed or inferred phenomena, past or present, aimed at building a testable body of knowledge that is open to rejection or confirmation.

scientific method: The use of the hypothetico-deductive method, that is, the process of (1) putting forward a hypothesis, (2) conjoining it with a statement of initial conditions, (3) deducing from the two a prediction, and (4) finding whether or not the prediction is fulfilled.

Search for Extraterrestrial Intelligence (SETI): The SETI Institute is based in Mountain View, California, and is the largest and most active organization searching for signals from extraterrestrials.

self-justification bias: The tendency to rationalize decisions after the fact to convince ourselves that what we did was the best thing we could have done.

sensed-presence effect: Sometimes called the third-man factor, the sense or feeling that someone or something else is present nearby, often triggered by monotony, darkness, barren landscapes, isolation, cold, injury, dehydration, hunger, fatigue, and fear.

shadow of enforcement: The mere presence of an authority figure or the implication that someone or something is watching (including an invisible watcher) makes people act more morally.

singularity: The point in time when computers will surpass human intelligence and the doubling power of technologies will be such that the world will change so rapidly that prediction is impossible. Singulartarian Ray Kurzweil predicts that the singularity will come around the year 2030, at which point medical technologies will be such that people will be able to live forever.

skepticism: The rigorous application of science and reason to test the validity of any and all claims.

sleep paralysis: A type of lucid dream in which dreamers are generally not aware that they are dreaming but, rather, have the perception of being awake and in bed. They often feel paralyzed, have difficulty breathing, feel pressure on the chest, and sense the presence of another being in the room. Additionally, they sometimes feel themselves floating, flying, falling, or leaving the body, with an emotional component that includes an element of terror but sometimes also excitement, exhilaration, rapture, or sexual arousal.

social facilitation: When the normal institutional brakes on behavior are lifted, evil acts may be facilitated through the contagious excitement of the group's actions.

soul: A religious definition of this term might read as follows: a conscious ethereal substance that is the unique essence of a living being that survives its incarnation in flesh. A scientific definition might read: the unique pattern of information that represents a person, stored in our DNA and neural networks.

Spinoza's dictum: An observation by the 17th-century Dutch philosopher Baruch Spinoza used as the motto of the Skeptics Society and *Skeptic* magazine: "I have made a ceaseless effort not to ridicule, not to bewail, not to scorn human actions, but to understand them."

status quo effect: The tendency to opt for whatever it is we are used to, that is, the status quo.

Stockholm syndrome: The process by which someone held captive comes to adopt the beliefs and sympathies of his or her captors.

sunk-cost effect: The tendency to believe in something because of the cost sunk into that belief.

synapse: The tiny gap between neurons in the brain by which they can communicate by releasing neurochemical transmitter substances across the gap to trigger (or not) the receiving neuron to "fire," or have an action potential.

temporal lobe transients: Increases and instabilities in the neuronal firing patterns in the temporal lobe region of the brain, located just above the ears. Such transients are associated with paranormal experiences.

theism: Belief in God or a deity or deities.

theory: A well-supported and well-tested hypothesis or set of hypotheses.

type I error: Assuming that two events are connected when they are not; also known as a false positive or believing that a pattern is real when it is not.

type II error: Assuming that two events are not connected when they are; also known as a false negative or not believing a pattern is real when it is.

UFO: Unidentified flying object. The key word here is "unidentified," which is not synonymous with "extraterrestrial," even though many people assume that if an object cannot be identified as something from this world, then it must be from another world.

verification: The process of testing predictions against further observations to confirm or disprove an initial hypothesis.

VMAT2 gene: Associated with increased self-transcendence, this gene is believed by some scientists to lead people to find pleasure in spiritual activities, such as prayer, meditation, chanting, singing, and other religious rituals.

warm reading: A type of mentalism in which someone does a reading of someone else by stating information that is true for nearly everyone.

Bibliography

Achenbach, Joel. *Captured by Aliens: The Search for Life and Truth in a Very Large Universe*. New York: Simon and Schuster, 1999.

Alcock, James E., and L. P. Otis. "Critical Thinking and Belief in the Paranormal." *Psychological Reports* 46 (1980): 479–482.

Allen, Steve. "The Jesus Cults: A Personal Analysis by the Parent of a Cult Member." *Skeptic* 2, no. 2 (1993): 36–49.

Amicus curiae Brief of Seventy-two Nobel Laureates, Seventeen State Academies of Science, and Seven Other Scientific Organizations, in Support of Appellees, Submitted to the Supreme Court of the United States, October Term, 1986, as *Edwin W. Edwards, in His Official Capacity as Governor of Louisiana, et al., Appellants v. Don Aguillard et al., Appellees*. 1986.

Aquinas, Thomas. *Summa Theologica*. Chicago: Encyclopedia Britannica, 1952.

Augustine, Keith. "Near-Death Experiences with Hallucinatory Features." *Journal of Near-Death Studies* 26, no. 1 (2007): 3–31.

Axelrod, Richard. *The Evolution of Cooperation*. New York: Basic Books, 1984.

Baker, Robert A. "The Aliens among Us: Hypnotic Regression Revisited." *Skeptical Inquirer* 12, no. 2 (1987/1988): 147–162.

Barrett, Deirdre. *Supernormal Stimuli: How Primal Urges Overran Their Evolutionary Purpose*. New York: W. W. Norton, 2010.

Barrow, John, and Frank Tipler. *The Anthropic Cosmological Principle*. Oxford: Oxford University Press, 1986.

Basalla, George. *Civilized Life in the Universe: Scientists on Intelligent Extraterrestrials*. Cambridge: Cambridge University Press, 2006.

Bem, Daryl J., and C. Charles Honorton. "Does Psi Exist? Replicable Evidence for an Anomalous Process of Information Transfer." *Psychological Bulletin* 115 (1994): 4–18.

Beyerstein, Barry L. "Altered States of Consciousness." In *The Encyclopedia of the Paranormal*, edited by G. Stein. Buffalo, NY: Prometheus, 1996.

Blackmore, Susan. *Dying to Live: Near-Death Experiences*. Buffalo, NY: Prometheus, 1993.

Blackmore, Susan, and R. Moore. "Seeing Things: Visual Recognition and Belief in the Paranormal." *European Journal of Parapsychology* 10 (1994): 91–103.

Blanke, O., S. Ortigue, T. Landis, and M. Seeck. "Neuropsychology: Stimulating Illusory Own-Body Perceptions." *Nature* 419 (Sept. 19, 2002): 269–270.

Bloom, Paul. *Descartes' Baby: How the Science of Child Development Explains What Makes Us Human*. New York: Basic Books, 2004.

Blum, S. H., and L. H. Blum. "Do's and Don'ts: An Informal Study of Some Prevailing Superstitions." *Psychological Reports* 35 (1974): 567–571.

Boehm, Christopher. *Hierarchy in the Forest: The Evolution of Egalitarian Behavior*. Cambridge, MA: Harvard University Press, 1999.

Brugger, Peter, and Christine Mohr. "Out of the Body, But Not Out of the Mind." *Cortex* 45 (2009): 137–140.

———. "The Paranormal Mind: How the Study of Anomalous Experiences and Beliefs May Inform Cognitive Neuroscience." *Cortex* 44, no. 10 (2008): 1291–1298.

Brugger, Peter, A. Gamma, R. Muri, M. Schafer, and K. I. Taylor. "Functional Hemispheric Asymmetry and Belief in ESP: Towards a 'Neuropsychology of Belief.'" *Perceptual and Motor Skills* 77 (1993): 1299–1308.

Byrd, Randolph C. "Positive Therapeutic Effects of Intercessory Prayer in a Coronary Care Unit Population." *Southern Medical Journal* 81 (1998): 826–829.

Camerer, Colin F., George Loewenstein, and Matthew Rabin, eds. *Advances in Behavioral Economics*. Princeton: Princeton University Press, 2004.

Catania, Charles, and David Cutts. "Experimental Control of Superstitious Responding in Humans." *Journal of the Experimental Analysis of Behavior* 6, no. 2 (1963): 203–208.

Cheyne, J. A., S. D. Rueffer, and I. R. Newby-Clark. "Hypnagogic and Hypnopompic Hallucinations during Sleep Paralysis: Neurological and Cultural Construction of the Nightmare." *Consciousness and Cognition* 8, no. 3 (1999): 319–337.

Cialdini, Robert. *Influence: The New Psychology of Modern Persuasion*. New York: William Morrow, 1984.

Clancy, Susan A. *Abducted: How People Come to Believe They Were Kidnapped by Aliens*. Cambridge, MA: Harvard University Press, 2007.

Collins, S., and J. Pinch. *The Golem: What Everyone Should Know about Science*. New York: Cambridge University Press, 1993.

Comings, David E. *Did Man Create God? Is Your Spiritual Brain at Peace with Your Thinking Brain?* Duarte, CA: Hope Press, 2008.

Coyne, Jerry. *Why Evolution Is True*. New York: Viking, 2009.

Craig, William Lane. *On Guard: Defending Your Faith with Reason and Precision*. Elgin, IL: David C. Cook Publishers, 2010.

Damasio, Antonio R. *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: Putnam, 1994.

Darley, John M., and Paul H. Gross. "A Hypothesis-Confirming Bias in Labelling Effects." *Journal of Personality and Social Psychology* 44 (1983): 20–33.

Davies, Paul. *The Mind of God*. New York: Simon & Schuster, 1991.

———. *Are We Alone? Philosophical Implications for the Discovery of Extraterrestrial Life*. New York: Basic Books, 1995.

Dawkins, Richard. *The God Delusion*. New York: Houghton Mifflin, 2006.

———. *The Selfish Gene*. Oxford/New York: Oxford University Press, 1976.

Dean, Jodi. *Aliens in America: Conspiracy Cultures from Outerspace to Cyberspace*. New York: Cornell University Press, 1998.

Demos, J. P. *Entertaining Satan: Witchcraft and the Culture of Early New England*. New York: Oxford University Press, 1982.

Dennett, Daniel. *Darwin's Dangerous Idea: Evolution and the Meanings of Life*. New York: Simon & Schuster, 1995.

———. *The Intentional Stance*. Cambridge, MA: MIT Press, 1987.

De Waal, Frans B. *Good Natured: The Origins of Right and Wrong in Humans and Other Animals*. Cambridge, MA: Harvard University Press, 1996.

———. *Chimpanzee Politics: Power and Sex among Apes*. Baltimore, MD: Johns Hopkins University Press, 1989.

Dick, Steven J. *Plurality of Worlds*. Cambridge: Cambridge University Press, 1982.

———. *The Biological Universe*. New York: Cambridge University Press, 1996.

Edwards, P. "Socrates." In *Encyclopedia of Philosophy*. Vol. 7, p. 482. New York: Macmillan, 1967.

Eliade, Mircea. *The Sacred and the Profane: The Nature of Religion*. Translated by W. R. Trask. New York: Harcourt Brace, 1957.

Evans-Pritchard, E. E. *Theories of Primitive Religion*. Oxford: Clarendon Press, 1965.

Fagan, Garret. *Archaeological Fantasies: How Pseudoarchaeology Misrepresents the Past and Misleads the Public*. New York: Routledge, 2006.

Feder, Kenneth L. *Frauds, Myths, and Mysteries: Science and Pseudoscience in Archaeology*. New York: McGraw-Hill, 2010.

Festinger, Leon, Henry W. Riecken, and Stanley Schachter. *When Prophecy Fails: A Social and Psychological Study*. New York: HarperCollins, 1964.

Foster, Kevin R., and Hanna Kokko. "The Evolution of Superstitious and Superstition-Like Behaviour." *Proceedings of the Royal Society B* 276 (2008): 31–37.

Frazer, James G. *The Golden Bough: A Study in Magic and Religion*. New York: Macmillan, 1924.

Fritze, Ronald. *Invented Knowledge: Fake History, False Science, and Pseudo-Religions*. London: Reaktion Books, 2011.

Futuyma, Douglas J. *Science on Trial: The Case for Evolution*. New York: Pantheon, 1983.

Galanter, M. *Cults: Faith, Healing, and Coercion*. 2nd ed. New York: Oxford University Press, 1999.

Gallup, G. H., Jr., and F. Newport. “Belief in Paranormal Phenomena among Adult Americans.” *Skeptical Inquirer* 15, no. 2 (1991): 137–147.

Gardner, Martin. *Fads and Fallacies in the Name of Science*. New York: Dover, 1952.

Geiger, John. *The Third Man Factor: The Secret of Survival in Extreme Environments*. New York: Penguin, 2009.

Gilkey, L., ed. *Creationism on Trial: Evolution and God at Little Rock*. New York: Harper & Row, 1985.

Gilovich, Thomas. *How We Know What Isn’t So: The Fallibility of Human Reason in Everyday Life*. New York: Free Press, 1993.

Gilovich, Thomas, and Gary Belsky. *Why Smart People Make Big Money Mistakes and How to Correct Them: Lessons from the New Science of Behavioral Economics*. New York: Fireside, 2000.

Gilovich, Thomas, Dale Griffin, and Daniel Kahneman. *Heuristics and Biases: The Psychology of Intuitive Judgment*. New York: Cambridge University Press, 2002.

Gilovich, Thomas, Richard Vallone, and Amos Tversky. “The Hot Hand in Basketball: On the Misperception of Random Sequences.” *Cognitive Psychology* 17 (1985): 295–314.

Glassner, Barry. *The Culture of Fear: Why Americans Are Afraid of the Wrong Things*. New York: Basic Books, 1999.

Godfrey, L. R., ed. *Scientists Confront Creationism*. New York: Norton, 1983.

Goldwag, Arthur. *Cults, Conspiracies, and Secret Societies*. New York: Vintage Books, 2009.

Gordin, Michael. *The Pseudoscience Wars: Immanuel Velikovsy and the Birth of the Modern Fringe*. Chicago: University of Chicago Press, 2012.

Gould, Stephen Jay. *Rocks of Ages: Science and Religion in the Fullness of Life*. New York: W. W. Norton, 2001.

———. *Bully for Brontosaurus*. New York: W. W. Norton, 1991.

Grabiner, Judith. V., and P. D. Miller. "Effects of the Scopes Trial." *Science*, no. 185 (1974): 832–836.

Greeley, A. M. *The Sociology of the Paranormal: A Reconnaissance*. Beverly Hills, CA: Sage, 1975.

Haidt, Jonathan. *The Divided Mind: Why Good People Are Divided by Politics and Religion*. New York: Pantheon, 2012.

———. "The Emotional Dog and Its Rational Tail: A Social Intuitionist Approach to Moral Judgment." *Psychological Review* 108 (2001): 814–834.

Hamer, Dean. *The God Gene: How Faith Is Hardwired into Our Genes*. New York: Anchor, 2005.

Harris, Sam. *The End of Faith*. New York: W. W. Norton, 2005.

Harris, Sam, Jonas Kaplan, Ashley Curiel, Susan Bookheimer, Marco Iacoboni, and Mark Cohen. "The Neural Correlates of Religious and Nonreligious Belief." *PloS One*. Oct. 1, 2009. 4(10): e0007272.

Harris, Sam, Sameer A. Sheth, and Marks S. Cohen. "Functional Neuroimaging of Belief, Disbelief, and Uncertainty." *Annals of Neurology* 63 (2007): 141–147.

Hassan, S. *Releasing the Bonds: Empowering People to Think for Themselves*. Somerville, MA: Freedom of Mind Press, 1990.

Hawking, Stephen W. *A Brief History of Time: From the Big Bang to Black Holes*. New York: Bantam, 1988.

Hawking, Stephen, and Leonard Mlodinow. *The Grand Design*. New York: Bantam Books, 2010.

Hochman, John. "Recovered Memory Therapy and False Memory Syndrome." *Skeptic* 2, no. 3 (1993): 58–61.

Hood, Bruce M. *Supersense: Why We Believe in the Unbelievable*. New York: HarperCollins, 2009.

Huff, Darrell. *How to Lie with Statistics*. New York: W. W. Norton, 1993.

Huxley, Aldous. *The Doors of Perception*. New York: Harper, 1954.

Hyman, Ray. "Anomaly or Artifact? Comments on Bern and Honorton." *Psychological Bulletin* 115 (1994): 19–24.

Johnson, D. M. "The 'Phantom Anesthetist' of Mattoon." *Journal of Abnormal and Social Psychology* 40 (1945): 175–186.

Kahneman, Daniel. *Thinking Fast and Slow*. New York: Farrar, Straus and Giroux, 2011.

Kahneman, Daniel, Paul Slovic, and Amos Tversky, eds. *Judgment under Uncertainty: Heuristics and Biases*. New York: Cambridge University Press, 1982.

Kevles, Daniel. *The Baltimore Case: A Trial of Politics, Science, and Character*. New York: W. W. Norton, 2000.

Keyes, K. *The Hundredth Monkey*. Coos Bay, OR: Vision, 1982.

Kihlstrom, J. F. "The Cognitive Unconscious." *Science*, no. 237 (1987): 1445–1452.

Killeen, P., R. W. Wildman, and R. W. Wildman II. "Superstitiousness and Intelligence." *Psychological Reports* 34 (1974): 1158.

Klaits, J. *Servants of Satan: The Age of the Witch Hunts*. Bloomington, IN: Indiana University Press, 1985.

Koch, Christof. *The Quest for Consciousness: A Neurobiological Approach*. Englewood, CO: Roberts and Company, 2004.

Krummenacher, Peter, Christine Mohr, Helene Haker, and Peter Brugger. "Dopamine, Paranormal Belief, and the Detection of Meaningful Stimuli." *Journal of Cognitive Neuroscience* 22 (2009): 1–12.

Kübler-Ross, Elizabeth. *On Death and Dying*. New York: Macmillan, 1969.

Kuhn, D. "Children and Adults as Intuitive Scientists." *Psychological Review* 96 (1989): 674–689.

Kurtz, Paul. *The Transcendental Temptation*. Buffalo, NY: Prometheus Books, 1991.

Kurzweil, Ray. *The Singularity Is Near*. New York: Penguin, 2006.

Kusche, Larry. *The Bermuda Triangle Mystery—Solved*. New York: Warner, 1975.

LeDoux, Joseph. *Synaptic Self: How Our Brains Become Who We Are*. New York: Viking, 2002.

Lennox, John. *Gunning for God: Why the New Atheists Are Missing the Target*. London: Lion Books, 2011.

Levin, J. S. "Age Differences in Mystical Experience." *The Gerontologist* 33 (1993): 507–513.

Lindberg, D. C., and R. L. Numbers. *God and Nature*. Berkeley: University of California Press, 1986.

Loftus, E., and K. Ketcham. *The Myth of Repressed Memory: False Memories and the Allegations of Sexual Abuse*. New York: St. Martin's Press, 1994.

Malinowski, Bronislaw. *Magic, Science, and Religion*. New York: Doubleday, 1954.

Marshall, Grant, Camille Wortman, Ross Vickers, Jeffrey Kusulas, and Linda Hervig. "The Five-Factor Model of Personality as a Framework for Personality-Health Research." *Journal of Personality and Social Psychology* 67 (1994): 278–286.

McGarry, J., and B. H. Newberry. "Beliefs in Paranormal Phenomena and Locus of Control: A Field Study." *Journal of Personality and Social Psychology* 41 (1981): 725–736.

McNally, Richard. *Remembering Trauma*. Cambridge, MA: Harvard University Press, 2004.

Michaud, Michael A. G. *Contact with Alien Civilizations: Our Hopes and Fears about Encountering Extraterrestrials*. New York: Copernicus Books, 2007.

Milgram, Stanley. *Obedience to Authority: An Experimental View*. New York: Harper, 1969.

Miller, Kenneth. *Finding Darwin's God*. New York: HarperCollins, 1999.

Mlodinow, Leonard. *The Drunkard's Walk: How Randomness Rules Our Lives*. New York: Vintage, 2009.

Moss, Cynthia. *Elephant Memories: Thirteen Years in the Life of an Elephant Family*. New York: Fawcett Columbine, 1988.

Musch, J., and K. Ehrenberg. "Probability Misjudgment, Cognitive Ability, and Belief in the Paranormal." *British Journal of Psychology* 93 (2002): 169–177.

Neher, A. *The Psychology of Transcendence*. New York: Dover, 1990.

Nelkin, Dorothy. *The Creation Controversy: Science or Scripture in the Schools*. New York: Norton, 1982.

Newberg, Andrew, E. D'Aquili, and V. Rause. *Why God Won't Go Away*. New York: Ballantine Books, 2001.

Nickerson, Raymond. "Confirmation Bias: A Ubiquitous Phenomenon in Many Guises." *Review of General Psychology* 2, no. 2 (1998): 175–220.

Numbers, Ronald. *The Creationists*. New York: Knopf, 1992.

Olds, James, and Peter Milner. "Positive Reinforcement Produced by Electrical Stimulation of Septal Area and Other Regions of Rat Brain." *Journal of Comparative and Physiological Psychology* 47 (1954): 419–427.

Olds, M. E., and J. L. Fobes. "The Central Basis of Motivation: Intracranial Self-Stimulation Studies." *Annual Review of Psychology* 32 (1981): 523–574.

Olson, Richard. *Science Deified and Science Defied*. Berkeley: University of California Press, 1991.

Ono, Koichi. "Superstitious Behavior in Humans." *Journal of the Experimental Analysis of Behavior* 47 (1987): 261–271.

Otis, L. P., and J. E. Alcock. "Factors Affecting Extraordinary Belief." *The Journal of Social Psychology* 118 (1982): 77–85.

Paul, Richard, and Linda Paul. *Critical Thinking: Tools for Taking Charge of Your Professional and Personal Life*. East Rutherford, NJ: FT Press, 2002.

Pendergrast, Mark. *Victims of Memory: Incest Accusations and Shattered Lives*. Hinesberg, VA: Upper Access, 1995.

Pigliucci, Massimo. *Nonsense on Stilts: How to Tell Science from Bunk*. Chicago: University of Chicago Press, 2010.

Pinker, Steven. *How the Mind Works*. New York: W. W. Norton, 1997.

Plank, Robert. *The Emotional Significance of Imaginary Beings*. Springfield, IL: Charles C. Thomas, 1968.

Polkinghorne, John. *Science and Christian Belief: Theological Reflections of a Bottom-Up Thinker*. London: SPCK, 1994.

Pronin, Emily, D. Y. Lin, and L. Ross. "The Bias Blind Spot: Perceptions of Bias in Self versus Others." *Personality and Social Psychology Bulletin* 28 (2002): 369–381.

Randi, James. *Flim-Flam!* Buffalo, NY: Prometheus, 1982.

Richardson, J., J. Best, and D. Bromley, eds. *The Satanism Scare*. Hawthorne, NY: Aldine de Gruyter, 1991.

Ridley, Matt. *The Origins of Virtue: Human Instincts and the Evolution of Cooperation*. New York: Viking, 1997.

Rosenhan, David L. "On Being Sane in Insane Places," *Science* 179 (Jan. 1973): 250–258.

Sacks, Oliver. *The Man Who Mistook His Wife for a Hat*. New York: Summit Books, 1995.

Sagan, Carl. *The Demon-Haunted World: Science as a Candle in the Dark*. New York: Random House, 1996.

———. *The Dragons of Eden: Speculations on the Evolution of Human Intelligence*. New York: Ballantine Books, 1977.

Sherif, Muzafer, O. J. Harvey, B. Jack White, William R. Hood, and Carolyn W. Sherif. *Intergroup Conflict and Cooperation: The Robbers Cave Experiment*. Norman, OK: University of Oklahoma Press, 1961.

Shermer, Michael. *Why People Believe Weird Things*. New York: Henry Holt/Times Books, 1997.

———. *How We Believe*. New York: Henry Holt/Times Books, 1999.

———. *Denying History: Who Says the Holocaust Never Happened and Why Do They Say It?* Berkeley: University of California Press, 2000.

———. *The Borderlands of Science*. New York: Oxford University Press, 2001.

——— *The Science of Good and Evil*. New York: Henry Holt/Times Books, 2003.

———. *Science Friction*. New York: Henry Holt/Times Books, 2005.

———. *Why Darwin Matters*. New York: Henry Holt/Times Books, 2006.

———. *The Mind of the Market*. New York: Henry Holt/Times Books, 2008.

———. *The Believing Brain*. New York: Henry Holt/Times Books, 2011.

Simons, Daniel J., and Christopher Chabris. *The Invisible Gorilla: How Our Intuitions Deceive Us*. New York: Broadway Books, 2011.

Skinner, B. F. "Superstition in the Pigeon." *Journal of Experimental Psychology* 38 (1948): 168–172.

Sloan, Richard. *Blind Faith: The Unholy Alliance of Religion and Medicine*. New York: St. Martin's Press, 2006.

Smith, George. *Atheism: The Case against God*. Buffalo, NY: Prometheus Books, 1991.

Stark, Rodney, and W. S. Bainbridge. *A Theory of Religion*. New Brunswick, NJ: Rutgers University Press, 1987.

Steibing, William. *Ancient Astronauts, Cosmic Collisions, and Other Popular Theories about Man's Past.* Amherst, MA: Prometheus Books, 1984.

Stenger, Victor. *The Unconscious Quantum: Metaphysics in Modern Physics and Cosmology*. Buffalo, NY: Prometheus Books, 1995.

———. *Has Science Found God? The Latest Results in the Search for Purpose in the Universe*. New York: Prometheus Books, 2003.

Suedfeld, P., and J. S. P. Mocellin. "The Sensed Presence in Unusual Environments." *Environment and Psychology* 19 (1987): 33–52.

Sulloway, Frank. *Born to Rebel: Birth Order, Family Dynamics, and Creative Lives*. New York: Pantheon, 1996.

Swift, David. *SETI Pioneers: Scientists Talk about Their Search for Extraterrestrial Intelligence*. Tucson, AZ: University of Arizona Press, 1990.

Taubes, Gary. *Bad Science*. New York: Random House, 1993.

Tavris, Carol, and Elliot Aronson. *Mistakes Were Made (But Not by Me)*. New York: Harcourt, 2007.

Thomas, Keith. *Religion and the Decline of Magic*. New York: Scribner's, 1971.

Tipler, Frank. *The Physics of Immortality: Modern Cosmology, God and the Resurrection of the Dead*. New York: Doubleday, 1994.

Tobacyk, J., and G. Milford. "Belief in Paranormal Phenomena: Assessment Instrument Development and Implications for Personality Functioning." *Journal of Personality and Social Psychology* 44 (1983): 1029–1037.

Tourney, C. P. *God's Own Scientists: Creationists in a Secular World*. New Brunswick, NJ: Rutgers University Press, 1994.

Trevor-Roper, H. R. *The European Witch-Craze of the Sixteenth and Seventeenth Centuries and Other Essays*. New York: Harper Torchbooks, 1969.

Trivers, Robert L. "The Evolution of Reciprocal Altruism." *Quarterly Review of Biology* 46 (1971): 35–57.

Tversky, Amos, and Daniel Kahneman. "The Framing of Decisions and the Psychology of Choice." *Science* 211 (1981): 453–458.

———. "Rational Choice and the Framing of Decisions." *Journal of Business* 59, no. 4 (1986): 2.

Tylor, Edward B. *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Language, Art, and Custom*. London: John Murray, 1871.

Vankin, J., and J. Whalen. *The Fifty Greatest Conspiracies of All Time*. New York: Citadel, 1995.

Victor, J. *Satanic Panic: The Creation of a Contemporary Legend*. Chicago: Open Court, 1993.

Vyse, Stuart A. *Believing in Magic: The Psychology of Superstition*. New York: Oxford University Press, 1997.

Walker, W. R., S. J. Hoekstra, and R. J. Vogl. "Science Education Is No Guarantee for Skepticism." *Skeptic* 9, no. 3 (2001).

Waller, N. G., B. Kojetin, T. Bouchard, D. Lykken, and A. Tellegen. "Genetic and Environmental Influences on Religious Attitudes and Values: A Study of Twins Reared Apart and Together." *Psychological Science* 1, no. 2 (1990): 138–142.

Ward, Keith. *God, Chance and Necessity*. Oxford: Oneworld, 1996.

Webb, S. *If the Universe Is Teeming with Aliens… Where Is Everybody? Fifty Solutions to Fermi's Paradox and the Problem of Extraterrestrial Life*. New York: Springer, 2003.

Whinnery, James E. "Psychophysiologic Correlates of Unconsciousness and Near-Death Experiences." *Journal of Near-Death Studies* 15, no. 4 (1997): 231–258.

Whinnery, J. E., and A. M. Whinnery. "Acceleration-Induced Loss of Consciousness: A Review of 500 Episodes." *Archives of Neurology* 47 (1990): 764–776.

Wilkinson, G. S. "Reciprocal Food Sharing in the Vampire Bat." *Nature* 308 (1984): 181–184.

Williams, Stephen. *Fantastic Archaeology: The Wild Side of North American Prehistory*. Philadelphia, PA: University of Pennsylvania Press, 1991.

Wiseman, Richard. *Paranormality: Why We See What Isn't There*. New York: Macmillan, 2011.

Wiseman, Richard, and Marilyn Schlitz. "Experimenter Effects and the Remote Detection of Staring." *Journal of Parapsychology* 61 (1997): 197–207.

Wood, Michael J., Karen M. Douglas, and Robbie M. Sutton. 2012. "Dead and Alive: Beliefs in Contradictory Conspiracy Theories." *Social Psychological and Personality Science* (January 2012).

Wulff, E. M. "Mystical Experience." In *Varieties of Anomalous Experience: Examining the Scientific Evidence*, edited by E. Cardena, S. J. Lynn, and S. Krippner. Washington, DC: American Psychological Association, 2000.

Zimbardo, Philip. *The Lucifer Effect: Understanding How Good People Turn Evil*. New York: Random House, 2007.